TOOELE
ARMY
DEPOT

FINAL

CORRECTIVE MEASURES STUDY REPORT
SWMU 10 - TNT WASHOUT FACILITY
KNOWN RELEASES SWMUs
TOOELE ARMY DEPOT
TOOELE, UTAH

Contract No. DACA31-94-D-0060
Delivery Order No.r 1

Prepared for:

TOOELE ARMY DEPOT
Tooele, Utah 84074

Prepared by:

URS

7101 Wisconsin Avenue, Suite 700
Bethesda, Maryland 20814

DISTRIBUTION UNLIMITED
APPROVED FOR PUBLIC RELEASE

JULY 2002

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ACRONYMS AND ABBREVIATIONS

AAP	Army Ammunition Plant
AUF	Area use factor
bgs	Below ground surface
BRAC	Base Realignment and Closure
°C	Degrees Celsius
CAO	Corrective action objective
CAP	Corrective Action Permit
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm^2	Square centimeter
cm/sec	Centimeter per second
CMIP	Corrective Measures Implementation Plan
CMS	Corrective Measures Study
COC	Contaminant of concern
COPC	Contaminant of potential concern
C_{term}	Concentration term
DCD	Deseret Chemical Depot
DCE	Dichloroethene
2,4-DNT	Dinitrotoluene
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
ET	Evapotranspiration cover
FFA	Federal Facility Agreement
ft	Foot
ft^2	Square foot
ft/day	Foot per day
ft/mi	Foot per mile
ft/yr	Foot per year
GAC	Granular activated carbon

ACRONYMS AND ABBREVIATIONS (cont'd)

GCL	Geosynthetic clay liner
GM	Geomembrane
gpm	Gallon per minute
HEAST	Health Effects Assessment Summary Tables
HELP	Hydrologic Evaluation of Landfill Performance
HI	Hazard index
HQ	Hazard quotient
IAAP	Iowa Army Ammunition Plant
in./yr	Inch per year
IRDMIS	Installation Restoration Data Management System
IRP	Installation Restoration Program
IWL	Industrial Waste Lagoon
JAAP	Joliet Army Ammunition Plant
k	Hydraulic conductivity
lb/ft^2	Pound per square foot
LDRs	Land disposal restrictions
MCL	Maximum contaminant level
µg/dL	Microgram per deciliter
µg/g	Microgram per gram
µg/L	Microgram per liter
$\mu g/m^3$	Microgram per cubic meter
µm	Micrometer
mm	Millimeter
m^2/sec	Square meter per second
m^3/day	Cubic meter per day
m^3/hr	Cubic meter per hour
NE	Not evaluated
NPL	National Priorities List
O&M	Operation and maintenance
OIWL	Old Industrial Waste Lagoon

ACRONYMS AND ABBREVIATIONS (cont'd)

OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbon
PPE	Personal protective equipment
ppm	Parts per million
PVC	Polyvinyl chloride
RA	Risk assessment
RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylenetrinitramine
RFI	RCRA Facility Investigation
RSA	Reference Study Area
Rust E&I	Rust Environment & Infrastructure
SABRE	Simplot anaerobic bioremediation
SESOIL	**SE**asonal **SOIL**
SIR	Soil ingestion rate
SWERA	Site-wide ecological risk assessment
SWMU	Solid waste management unit
TBV	Toxicity Benchmark Value
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity characteristic leaching procedure
TEAD	Tooele Army Depot
TEAD-N	Tooele Army Depot - North Area
TEAD-S	Tooele Army Depot - South Area
TECA	Tooele Chemical Activity
TNB	Trinitrobenzene
TNT	Trinitrotoluene
TSDF	Treatment, storage, and disposal facility
UAC	Utah Administrative Code
UCL	Upper confidence limit
UDEQ	Utah Department of Environmental Quality

ACRONYMS AND ABBREVIATIONS (cont'd)

USAEC	U.S. Army Environmental Center
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency (now USAEC)
WOE	Weight-of-evidence
yd^3	Cubic yard

EXECUTIVE SUMMARY

This document is the Corrective Measures Study (CMS) Report for Solid Waste Management Unit (SWMU) 10 at Tooele Army Depot (TEAD; formerly the North Area), Tooele, Utah. SWMU 10, known as the Trinitrotoluene (TNT) Washout Facility, is designated as one of the Known Releases SWMUs. This CMS Report has been prepared for TEAD, in association with the U.S. Army Environmental Center (USAEC), in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action Permit (CAP; UT3213820894) issued to TEAD by the State of Utah.

The purpose of the CMS Report is to recommend a corrective measures alternative:

- For each SWMU for which the baseline risk assessment (RA) determined a significant threat to human health under the future residential land use scenario.

  – or –

- For each SWMU that poses a threat to the environment.

According to the State of Utah Administrative Code (UAC; Regulation 315-101-6(c)3), a site management plan must be prepared for SWMUs that pose a human health cancer risk greater than 1×10^{-6}, a noncancer hazard index (HI) greater than 1.0, or a modeled blood lead level greater than 10 micrograms per deciliter under the future residential land use scenario. The requirement for a site management plan is fulfilled by the CMS Work Plan and this CMS Report.

For SWMUs that pose an unacceptable threat to human health or the environment under current and likely future land use conditions, the CMS evaluates both active corrective measures (i.e., treatment technologies) and management measures. For SWMUs that do not pose an unacceptable threat to human health or the environment under current and reasonably anticipated future land use conditions, the CMS evaluates management measures (e.g., monitoring or deed restrictions) and may consider active corrective measures.

The CMS Report presents a detailed evaluation of the corrective measures alternatives developed in the Known Releases SWMUs CMS Work Plan (Dames & Moore, 2000) for the management of identified risks at SWMU 10, which was determined in the Phase II RFI (Rust E&I, 1995) to pose human health or environmental risks.

The Known Releases SWMUs CMS Work Plan (Dames & Moore, 2000) identified potential corrective measures alternatives for seven Known Releases SWMUs including the TNT Washout Facility. This was accomplished by developing corrective action objectives (CAOs) for the contaminants of potential concern (COPCs) in the various media under the likely future land use scenarios. For SWMU 10, the likely future land use is continued military.

The CAOs developed in the CMS Work Plan (Dames & Moore, 2000) included quantitative risk-based objectives and qualitative regulatory-driven objectives. COPCs were compared to quantitative CAOs to identify contaminants of concern (COCs). The CMS Work Plan identified corrective measures – which may include treatment technologies or management measures – that meet the qualitative and quantitative CAOs, and assembled them into corrective measures alternatives.

The seven SWMUs identified in the CMS Work Plan were included in a Draft Known Releases SWMUs CMS Report issued in February 2000. However, based on discussions between the U.S. Army and State and Federal regulators, SWMUs 10 and 12/15 are being issued separately to allow for additional data gathering.

The corrective measures alternatives considered for SWMU 10 are listed below:

- Excavation and composting of explosives in soil at the former TNT washout ponds, groundwater monitoring, and land use restrictions to prevent groundwater use and residential development.

- Excavating and composting of explosives in soil at the former TNT washout ponds, land use restrictions to prevent groundwater use and residential development, and groundwater extraction and treatment using carbon adsorption.

- Excavation and slurry treatment of explosives in soil at the former TNT washout ponds, groundwater monitoring, and land use restrictions to prevent groundwater use and residential development.

- Excavation, off-post treatment/disposal of explosives in soil at the former TNT washout ponds, groundwater monitoring, and land use restrictions to prevent groundwater use and residential development.

- Construction of a multilayer cap over explosives contaminated soil at the former TNT washout ponds, groundwater monitoring, and land use restrictions to prevent groundwater use and residential development.

The detailed evaluation of each corrective measures alternative considers technical criteria (including performance, reliability, implementability, and safety), protection of human health, environmental assessment, administrative feasibility, and cost, as outlined below:

- Technical criteria

  – Performance – Evaluates the ability of the alternative to perform its intended function and to meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000). Factors affecting performance – including site and waste characteristics – are also considered, along with the length of time the alternative maintains its intended level of effectiveness.

  – Reliability – Describes the long-term effectiveness and permanence of each alternative, and evaluates the adequacy of the treatment technology based on performance at similar sites, operation and maintenance (O&M) requirements, long-term environmental monitoring needs, and residuals management requirements.

  – Implementability – Assesses the technical and institutional feasibility of executing an alternative, including constructability, permit and legal/ regulatory requirements, and availability of materials. This criterion also addresses the length of time from implementation of the alternative until beneficial effects are realized.

  – Safety – Considers potential threats to workers, off-post residential communities, and the environment during implementation of the corrective measure.

- Human health assessment – Evaluates the extent to which each alternative protects human health. This criterion considers the classes and concentrations of contaminants left onsite, potential exposure routes, and potentially affected populations. Residual contaminant concentrations are compared to existing criteria, standards, and guidelines.

- Environmental assessment – Evaluates short- and long-term effects of the corrective measure on the environment, including adverse impacts to environmentally sensitive areas.

- Administrative feasibility – Considers compliance with applicable Federal, State, and local environmental and public health standards, requirements, criteria, or limitations.

- Cost – Considers capital and annual O&M costs for each alternative.

Based on the detailed evaluations conducted in this CMS, the ***recommended corrective measures alternative*** for SWMU 10 is as follows:

- Excavating, composting, groundwater monitoring, and land use restrictions at the TNT Washout Facility (SWMU 10).

Table ES-1 summarizes the corrective measures alternatives evaluated in the CMS for SWMU 10; also included are summaries of the results of the human health and ecological RA, potential effects on groundwater, and identified COCs.

The CMS Report addresses how the alternatives reduce exposure to contamination, contaminant concentration, or contaminant migration.

This recommended corrective measures alternative is presented to the public in the Decision Document. Once the recommendations are accepted, TEAD's RCRA Post Closure Monitoring and Corrective Action Permit will be modified to include the approved CMS Report and Decision Document.

TABLE ES-1

Summary of Corrective Measures Alternatives
TNT Washout Facility (SWMU 10)

SWMU	Results of Human Health RA (a)						Potential Effects on Groundwater?	Results of Ecological RA (b)	COCs (c)	Corrective Measures Alternatives (including cost) (d)
	Military			Industrial/Construction						
	Cancer Risk	HI	Blood Lead	Cancer Risk	HI	Blood Lead				
TNT Washout Facility (SWMU 10)	1.3×10^{-5}	2.1	NE	6.1×10^{-7}	12	NE (e)	Yes	Potential unacceptable risk	Explosives	**Excavation, composting, groundwater monitoring, and land use restrictions ($2,470,000)** Excavation, composting, groundwater extraction and treatment, and land use restrictions ($4,450,000) Excavation, slurry treatment, groundwater monitoring, and land use restrictions (Argonne Process, $4,260,000; SABRE Process, $4,240,000) Excavation, off-post treatment/disposal, groundwater monitoring, and land use restrictions ($4,170,000) Multilayer cap, groundwater monitoring, and land use restrictions ($2,130,000)

(a) Based on the Phase II RFI Report (Rust E&I, 1995). In accordance with UAC 315-101, a SWMU requires active corrective measures if risks, HIs, or blood lead levels under the reasonably anticipated land use scenario exceed 1×10^{-4}, 1.0, or 10 µg/dL, respectively. Maximum risk, HI, and blood level reported.
(b) Ecological RA results from the Site-Wide Ecological RA Report (SWERA; Rust E&I, 1997).
(c) Human health contaminants of concern (COC). Specific COCs are listed in Section 3.0.
(d) The preferred corrective measures alternative for each SWMU is shown in bold italic type.
(e) NE = pathway incomplete or not evaluated; see CMS Work Plan (Dames & Moore, 2000).

1.0 INTRODUCTION

This document is the Corrective Measures Study (CMS) Report for Solid Waste Management Unit (SWMU) 10 at Tooele Army Depot (TEAD; formerly the North Area), Tooele, Utah. SWMU 10, known as the Trinitrotoluene (TNT) Washout Facility, is designated as one of the Known Releases SWMUs. This CMS Report has been prepared for TEAD, in association with the U.S. Army Environmental Center (USAEC), under Alternatives Development and Decision Documents for TEAD – North Area (TEAD-N), Contract No. DACA31-94-D-0060, Delivery Order No. 1. This CMS Report was developed in accordance with Module VII, Corrective Action, of the Resource Conservation and Recovery Act (RCRA) Corrective Action Permit (CAP; UT3213820894) issued to TEAD by the State of Utah Department of Environmental Quality (UDEQ) in January 1991.

1.1 PURPOSE AND SCOPE

The CMS Report represents one of the major steps in the RCRA corrective action process of protecting human health and the environment from the chemicals released at a facility. In accordance with State of Utah guidance, this report is based on the evaluations and conclusions of the Known Releases SWMUs Phase II RCRA Facility Investigation (RFI) Report (Rust Environment & Infrastructure (E&I), 1995) and the Known Releases SWMUs CMS Work Plan (Dames & Moore, 2000). The RFI delineates the nature and extent of chemical constituents in the environment, and evaluates potential risks to human health and impacts to the environment. The CMS Work Plan identifies site-specific corrective measures alternatives that address the potential risks and hazards at each SWMU.

The purpose of this CMS Report is to analyze the corrective measures alternatives developed in the CMS Work Plan (Dames & Moore, 2000) for SWMU 10. This SWMU was determined in the Phase II RFI Report (Rust E&I, 1995) to pose unacceptable risks to human health under the future residential land use scenario, which must be evaluated per Utah Administrative Code (UAC) R315-101-5.2(b)(1). The objective in conducting the CMS is to protect human health and the environment during current and expected future land use. This does ***not*** include cleaning up the facility to standards that apply for other land uses. If other uses are considered in the future, it will be necessary to reevaluate the corrective measures alternatives identified for this SWMU.

The Known Releases SWMUs CMS Work Plan identified seven Known Releases SWMUs which posed human health or environmental risks. All seven SWMUs were included in a Draft Known Releases SWMUs CMS Report issued in February 2000. However, based on discussions between the U.S. Army and State and Federal regulators, SWMUs 10 and 12/15 are being issued separately to allow for additional data gathering.

The CMS Report is intended to be used in conjunction with the CMS Work Plan **(Dames & Moore, 2000);** ***most information presented in the work plan is not***

repeated in this report. The CMS Work Plan summarizes TEAD background information, including location, physical characteristics, history, present mission, future use, and previous investigations/regulatory overview. Also included for each SWMU are descriptions of background, summaries of contamination assessment from the Phase II RFI Report (Rust E&I, 1995), results of human health and ecological risk assessments (RAs), interim corrective actions (as applicable), identification of corrective action objectives (CAOs) and contaminants of concern (COCs), qualitative estimates of extent of contamination (as applicable), and development of corrective measures alternatives.

1.2 BACKGROUND

TEAD is located in Tooele Valley in Tooele County, Utah, immediately west of the City of Tooele and approximately 30 miles southwest of Salt Lake City (Figure 1-1). The U.S. Army Ordnance Department established the Tooele Ordnance Depot in 1942. It was redesignated as TEAD-N in August 1962; also at this time, the former Deseret Chemical Warfare Depot was renamed TEAD – South Area (TEAD-S). Both the North and South Areas of TEAD have been major ammunition storage and equipment maintenance installations that support other U.S. Army installations throughout the western United States. In 1996, TEAD-N and TEAD-S were designated as TEAD and Tooele Chemical Activity (TECA), respectively. In October 1996, TECA was renamed the Deseret Chemical Depot (DCD).

The current missions of TEAD are:

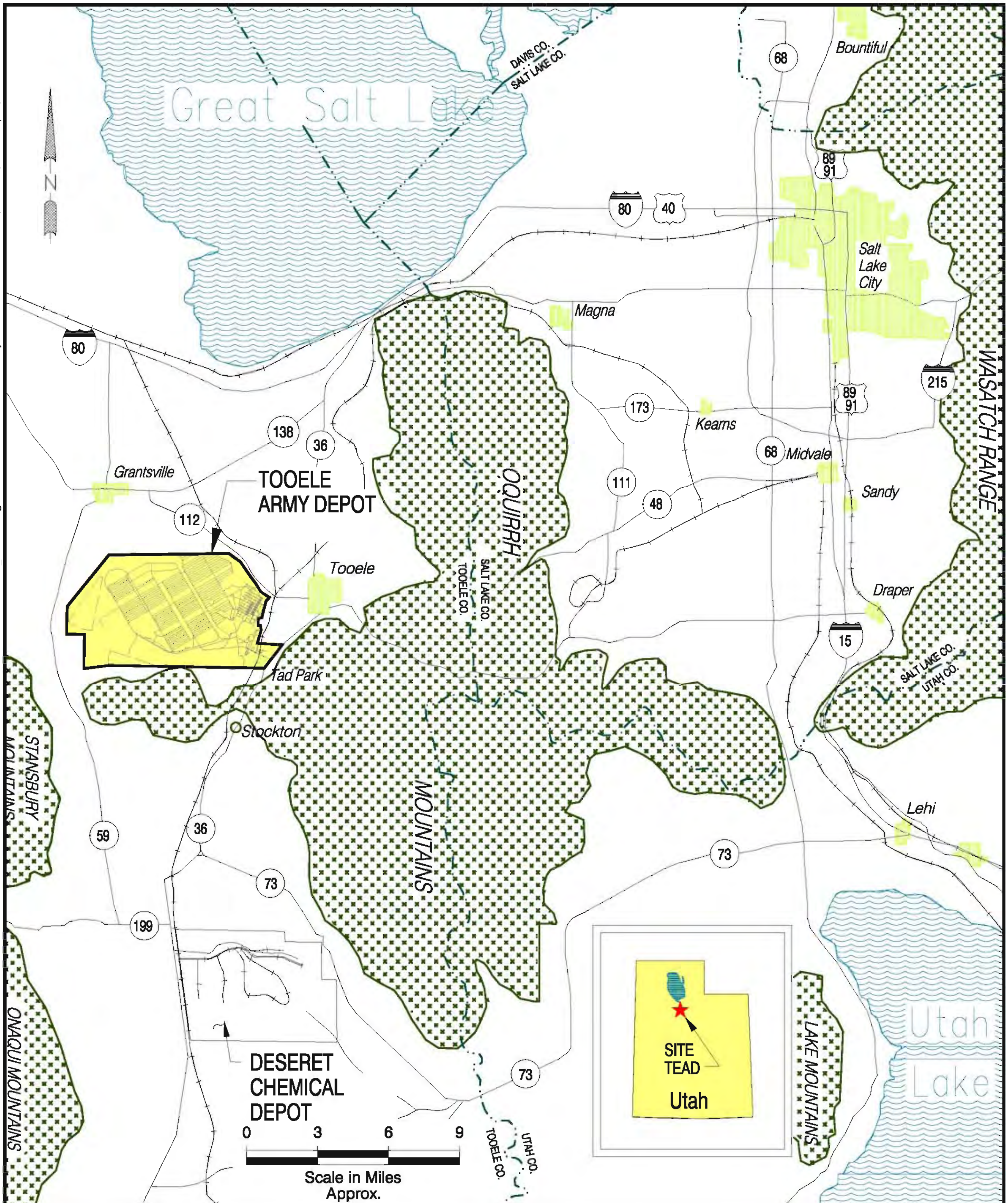
- To receive, store, issue, maintain, and dispose of munitions
- To provide installation support to attached organizations
- To operate other facilities as assigned.

The mission of maintaining and repairing equipment was discontinued in 1995.

Developed features at TEAD include igloos, magazines, administrative buildings, an industrial maintenance area, military and civilian housing, roads, and vehicle storage hardstands and other allied infrastructure. In 1993, TEAD was placed on the list of military facilities scheduled for realignment under the Base Realignment and Closure (BRAC) Program. (A portion of the Old Industrial Waste Lagoon (OIWL; SWMU 30) is included in the BRAC parcel.)

As a result of past activities at the installation, TEAD was included in the U.S. Army's Installation Restoration Program (IRP) in 1978. The first component of that program was an Installation Assessment (U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), 1979), which identified a number of known and potential waste and spill sites and recommended further investigations.

In 1984, TEAD was nominated for inclusion on the National Priorities List (NPL) because of identified hazardous constituents at some sites, particularly the Industrial Waste Lagoon (IWL; SWMU 2). However, TEAD was not placed on the NPL until October 1990.



SOURCE: RUST E&I, 1995

P:\Bethesda\U00000572 USACE\89-F1000162.00-Tooele\GRP_KR\drawings\CMS-REPORT\FIG1-1.DWG, Layout1, 3/3/2003 10:37:16 AM, sokhons, BTH07D.pc3, 1:0.895517

FIGURE 1-1
LOCATION MAP OF
TOOELE ARMY DEPOT
AND VICINITY

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In the interim, the U.S. District Court for the State of Utah issued a consent decree to TEAD for groundwater contamination at SWMU 2.

As part of being placed on the NPL, a Federal Facility Agreement (FFA) was entered into between the U.S. Army, U.S. Environmental Protection Agency (EPA) Region 8, and UDEQ in September 1991. The FFA addresses 17 SWMUs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In January 1991, TEAD was issued a RCRA Post Closure Permit for the IWL (SWMU 2). The permit included a CAP that required action at 29 SWMUs. Additional SWMUs have since been added to the RCRA CAP, which is regulated by UDEQ.

Since the initial assessment of TEAD, a number of environmental investigations have been performed (and are ongoing) under CERCLA or RCRA. At TEAD, these additional investigations have identified 57 sites, including nine designated as the Known Releases SWMUs. These SWMUs are managed under the RCRA CAP program. The Phase II RFI Report (Rust E&I, 1995) determined that seven of these Known Releases SWMUs pose an unacceptable human health risk under the future residential land use scenario. Therefore, according to UAC R315-101-6(c)3, a risk-based closure will not be granted, and a site management plan – the requirements of which are met by a CMS – must be prepared.

This CMS Report discusses the TNT Washout Facility (SWMU 10). Figure 1-2 shows the location of SWMU 10.

1.3 REPORT ORGANIZATION

The remainder of the CMS Report is organized as follows:

- Discussion of evaluation criteria used in the detailed analysis of corrective measures alternatives (Section 2.0).

- Summary of pertinent information presented in the Phase II RFI (Rust E&I, 1995) and the CMS Work Plan (Dames & Moore, 2000) for SWMU 10 (Section 3.0). This includes a description of the SWMU; the magnitude and extent of contamination; results of the human health risks and hazards assessment for realistic future uses only; results of the ecological RA; CAOs; COCs; and potentially applicable corrective measures alternatives. Each area-specific corrective measures alternative is evaluated in detail based on the criteria presented in Section 2.0. The alternatives are then compared, and one is recommended for implementation at SWMU 10.

- Summary of recommended corrective measures alternative for SWMU 10 (Section 4.0).

- References (Section 5.0).

- Supporting cost data for each recommended corrective measures alternative (Appendix A).

- Groundwater extraction well modeling and natural attenuation (Appendix B).

- Ecological risks summary for SWMU 10 (Appendix C).

- C-Soil Model Results (Appendix D).

- Additional Soil Sampling Activities (Appendix E).

The Final Additional Field Investigation Report (URS-Dames & Moore, 2001) presents the results of the 1997 additional sampling activities at SWMU 10. Groundwater modeling for SWMU 10 is presented in Volume III of the Draft Known Releases SWMUs CMS Report (Dames & Moore, 2000a).

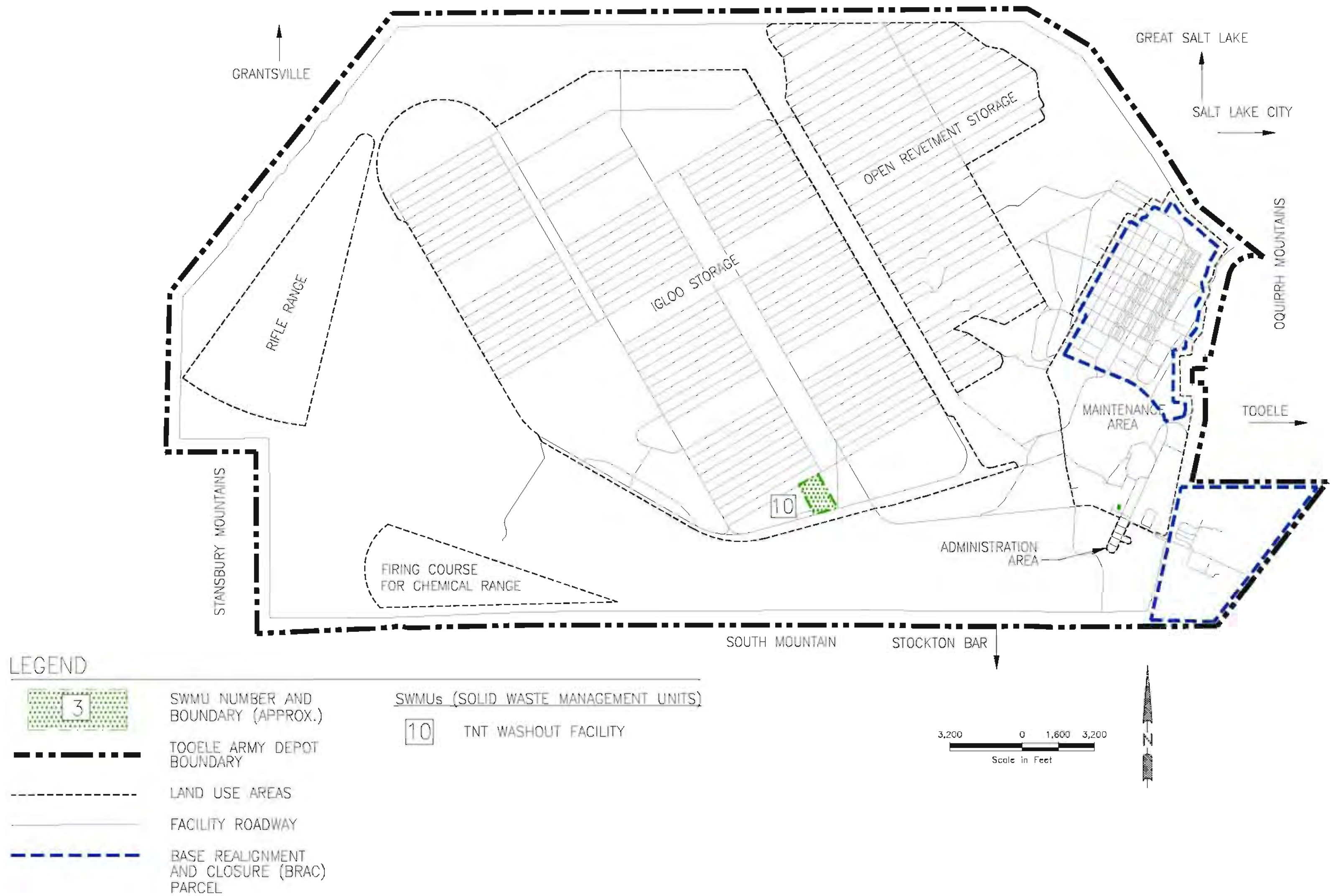

FIGURE 1-2
LOCATION OF KNOWN RELEASES SWMU 10
TOOELE ARMY DEPOT

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2.0 DESCRIPTION OF EVALUATION CRITERIA

The CMS Work Plan (Dames & Moore, 2000) identifies corrective measures alternatives for SWMU 10. Alternatives are identified by developing CAOs for the contaminants of potential concern (COPCs) in the various media under the assumed future land use scenarios.

The CAOs include quantitative risk-based objectives and qualitative regulatory-driven objectives. They are based on land use and potential receptor assumptions, exposure pathways, results of the human health RA, regulatory criteria, and background sample results. The CAOs for SWMU 10 are based on the current and likely future military land use. The CAOs were developed in accordance with UAC R315-101, including the "Principle of Non-Degradation"; EPA guidance (USEPA, 1991); the human health RA for the Known Releases SWMUs (Rust E&I, 1995); the Revised Final Site-Wide Ecological Risk Assessment (SWERA; Rust E&I, 1997); and U.S. Army policy (Radkiewicz, 1995). The COPCs are compared to quantitative CAOs to identify COCs.

To determine which contaminants require action, consideration is given to whether average concentrations across the site (i.e., exposure point concentration (EPC) as used in the RA) exceed the CAO, whether COCs are isolated and at low levels, or whether contaminants present unacceptable ecological risks.

Corrective measures – which may include management measures or treatment technologies that meet the CAOs and address the COCs – are assembled into corrective measures alternatives. The alternatives are developed according to RCRA guidance on performing a CMS (Sperber, 1996) and UDEQ regulations. The CMS Work Plan explains the methodology in detail. Figure 2-1 summarizes the alternatives development procedure.

RCRA criteria are used to evaluate each of the corrective measures alternatives identified in the CMS Work Plan. In accordance with RCRA guidance on performing a CMS (Sperber, 1996) and Module VII of the RCRA Part B Permit for TEAD, the detailed evaluation of each corrective measures alternative presented in Section 3.0 considers technical criteria (including performance, reliability, implementability, and safety), protection of human health, protection of the environment, administrative feasibility, and cost, as defined below:

- Technical criteria

  – Performance – Evaluates whether the corrective measures alternative can perform its intended function and meet the CAOs developed in the CMS Work Plan (Dames & Moore, 2000), including compliance with Federal, State, and local regulations. This criterion considers site and waste characteristics, and also the length of time the alternative maintains its intended level of effectiveness.

- Reliability – Describes the long-term effectiveness and permanence of each alternative. This criterion evaluates the adequacy of the corrective measure based on performance at similar sites, operation and maintenance (O&M) requirements, long-term environmental monitoring needs, and residuals management requirements.

- Implementability – Assesses the technical and institutional feasibility of executing a corrective measures alternative, including constructability, permit and legal/regulatory requirements, availability of materials, and length of time from implementation to realization of beneficial effects.

- Safety – Considers the potential threats to workers, nearby communities, and the environment during implementation of the corrective measure.

• Human health assessment – Evaluates the extent to which each alternative protects human health. This criterion considers the classes and concentrations of contaminants left onsite, potential exposure routes, and potentially affected populations. Residual contaminant concentrations are also compared to existing criteria, standards, or guidelines.

• Environmental assessment – Evaluates short- and long-term effects of the corrective measure on the environment, including adverse impacts to environmentally sensitive areas.

• Administrative feasibility – Considers compliance with applicable Federal, State, and local environmental and public health standards, requirements, criteria, or limitations.

• Cost – Considers capital and annual O&M costs for each corrective measures alternative. Capital costs include direct and indirect costs. Annual O&M costs typically include labor, maintenance, energy, and sampling/analysis. For purposes of comparison, costs are presented in terms of present worth (i.e., the current value of a future expenditure). The cost estimates are based on conventional cost estimating guides, vendor information, and engineering judgment. For alternatives with soil excavation and disposal, a preliminary assessment is made concerning whether the soil will be RCRA hazardous as define in 40 CFR Part 261. Appendix A presents the detailed cost estimate tables.

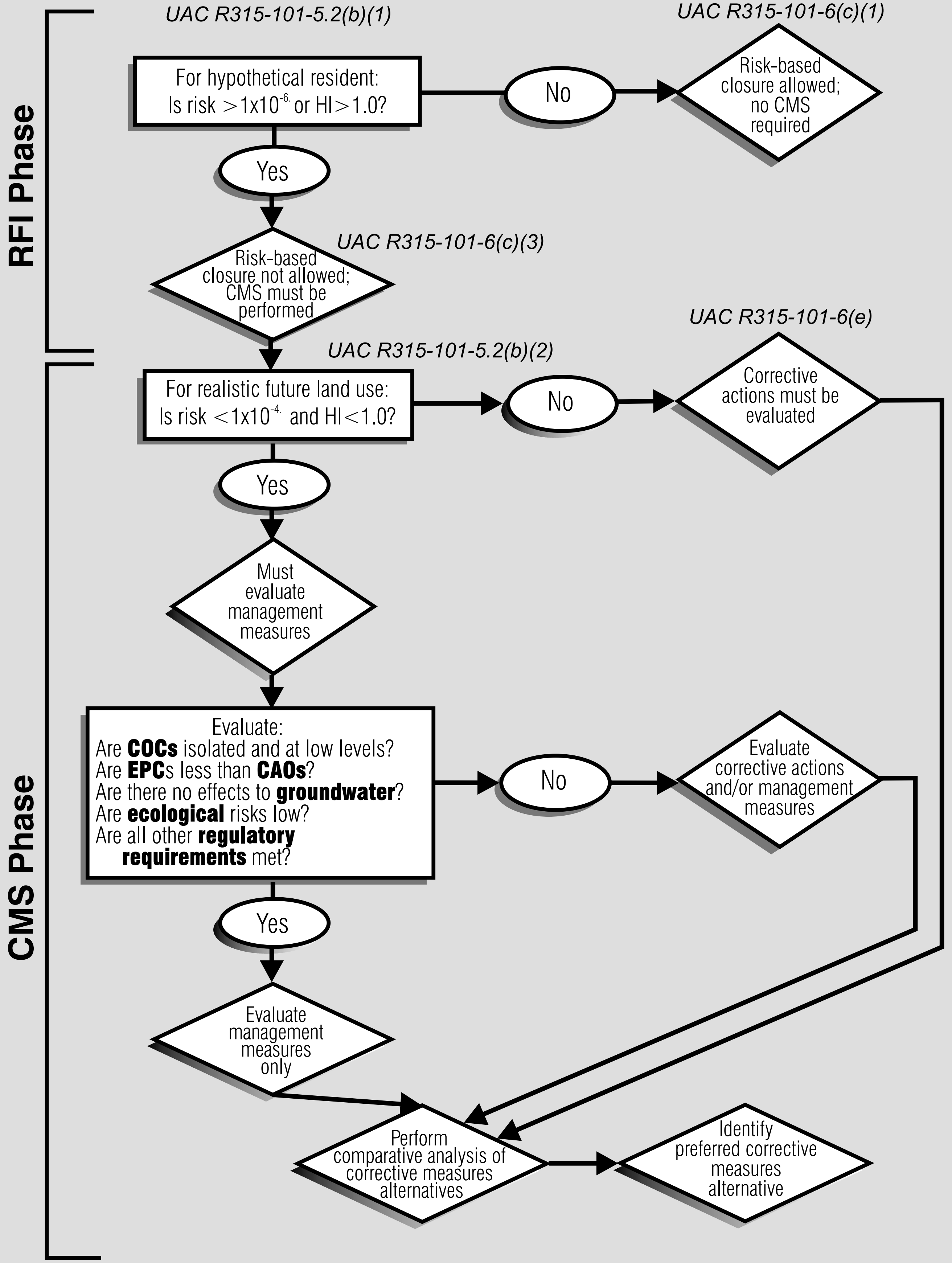

FIGURE 2-1
DEVELOPMENT OF CORRECTIVE MEASURES ALTERNATIVES

09604\056 FIG2-1.CDR (01/03/2000) KD

3.0 TNT WASHOUT FACILITY (SWMU 10)

Section 3.0 evaluates corrective measures alternatives for the TNT Washout Facility (SWMU 10; Figure 3-1). Data from the CMS Work Plan (Dames & Moore, 2000), the human health RA (Rust E&I, 1995), and the SWERA (Rust E&I, 1997) are also summarized below.

As shown on Figure 3-1, the TNT Washout Facility occupies approximately 14 acres in the south-central section of TEAD. The facility was constructed in 1948 and operated through 1986; however, from 1966 through 1986, it was active only for an approximate total of 6 months. The TNT Washout Facility consisted of the bomb reconditioning building (Building 1245), a storage facility (Building 1246, removed in 1993), eight unlined old TNT washout ponds, one unlined new TNT washout pond, two in-ground steel settling tanks (removed in 1996), a series of unlined ditches, and underground piping. The decommissioning of munitions consisted of opening munition casings, removing explosives, rinsing casings, filtering the rinsewater, and discharging it to settling tanks and then through ditches and underground piping to the washout ponds. The old washout ponds were closed in 1984 by covering them with soil and a PVC liner. However, this PVC liner may not have been installed and maintained according to Utah closure regulations. Therefore this cap does not adequately protect ecological receptors and could allow for infiltration of precipitation and leaching of soil contaminants to groundwater.

3.1 SUMMARY OF RAs AND CMS WORK PLAN

The Phase II RFI (Rust E&I, 1995) identified unacceptable cancer risks and HIs for the hypothetical future adult and child residents at the TNT Washout Facility. Therefore, according to EPA guidance (discussed in Section 2.0 of the CMS Work Plan) and UAC R315-101-6(c)(3), this SWMU is included in the CMS process, and corrective measures must be evaluated. In addition, though no elevated cancer risks were identified for the actual current and likely future Depot personnel or for the future construction worker, elevated HIs were identified for both receptors.

The SWERA (Rust E&I, 1997) indicated that SWMU 10 is likely to pose unacceptable ecological risks based on explosives in vegetation sampled at the site. Therefore, ecological risks are considered in the assessment of corrective measures.

During investigations at SWMU 10, a groundwater plume of explosives (Figure 3-2) was detected, with cyclotrimethylenenitramine (RDX) as the primary component. RDX was detected in three wells in 1997 and two wells in 2001. The 1997 RDX concentrations in wells N-3H, N-3A, and N-133-90 were 95 Φg/L, 36.5 Φg/L, and 0.54 Φg/L, respectively. In 2001, wells N-3H and N-3A had RDX detections of 2.4 Φg/L and 13.1 Φg/L, respectively. TNT was detected at less than 2 Φg/L in wells N-127-88, N-128-88, and N-130-88 in 1998. TNT has not been detected in any SWMU 10 wells since

1998. Lower levels of other explosives have also been detected at infrequent and very low concentrations (Rust E&I, 1995). The depth to groundwater is approximately 240 feet bgs.

The general direction of groundwater flow across TEAD is from south to north-northwest, with groundwater entering TEAD from the southeast, south, and southwest. Previous investigations indicate the presence of localized perched water tables beneath SWMU 10, which varies in depth from 17 to 180 feet (Montgomery Watson, 1997). The perched zone is ephemeral, and completely dried up once the source of water disappeared; thus, it likely does not fall under Utah's non-degradation policy. Two sources of water have been identified as possible historical contributors to the perched zone. The first was the washout ponds and the second a burst water main. Both sources of water are now gone. Additional information concerning the perched zone is presented in the CMS Work Plan (Dames & Moore, 2000) and Additional Field Investigation Report (Dames & Moore, 2001). The groundwater modeling study in Volume III of the Draft Known Releases SWMUs CMS Report (Dames & Moore, 2000a) evaluated whether the RDX contaminant plume or its breakdown products would migrate to the TEAD boundary and, if so, at what rate. Based on modeling results, the plume appears to reach the limit of its migration within 50 years, at which time it likely reaches a steady-state condition – largely due to the combined factors of degradation, dispersion, and sorption. Based on the concentrations of contaminants measured during previous investigations, and the conservative assumptions of the model (which evaluates a worst case scenario), it is unlikely that the explosives plume will reach the TEAD boundary if left unremediated. The monitoring results between 1997 and 2001 suggest a decrease in RDX concentration and no migration off-site.

The CMS Work Plan (Dames & Moore, 2000) identified COCs by comparing the maximum concentration of each COPC identified in the Phase II RFI (Rust E&I, 1995) to its respective quantitative CAO. Based on this evaluation, 2,4,6-TNT and RDX are the COCs for surface soil and subsurface soil at SWMU 10. The COC locations are presented on Figure 3-3. The following table shows the maximum concentrations of the COCs identified in surface and subsurface soil compared to their CAOs (in micrograms per gram (µg/g)):

TNT WASHOUT FACILITY (SWMU 10)			
COC	**Maximum Concentration (µg/g)**	**EPC (µg/g)**	**CAO (µg/g)**
Surface soil			**Depot Personnel**
2,4,6-TNT	20,700	2,500	86
RDX	1,100	130	31
Subsurface soil			**Construction Worker**
2,4,6-TNT	1,200	146.3	710
RDX	553	94.2	200

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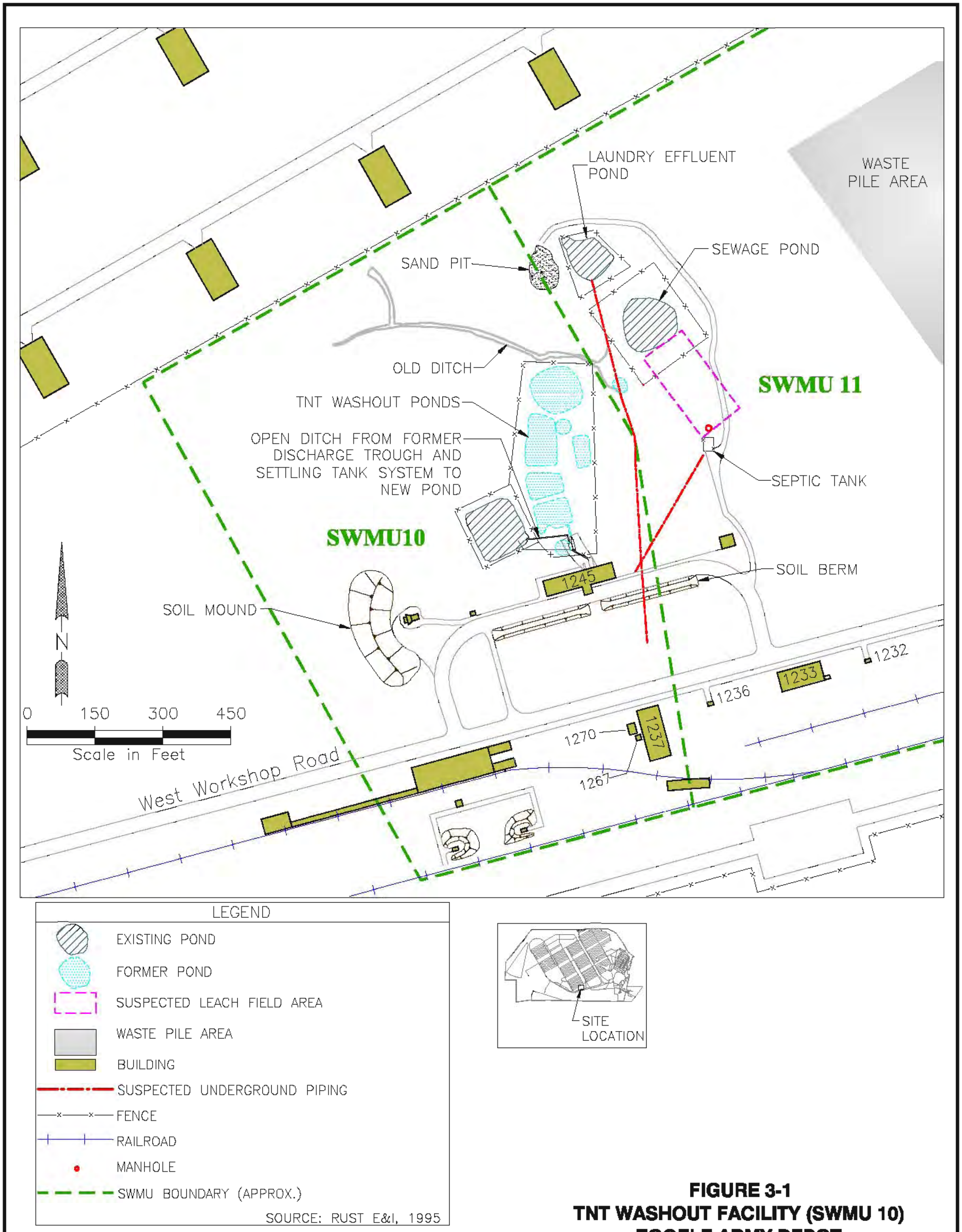

FIGURE 3-1
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

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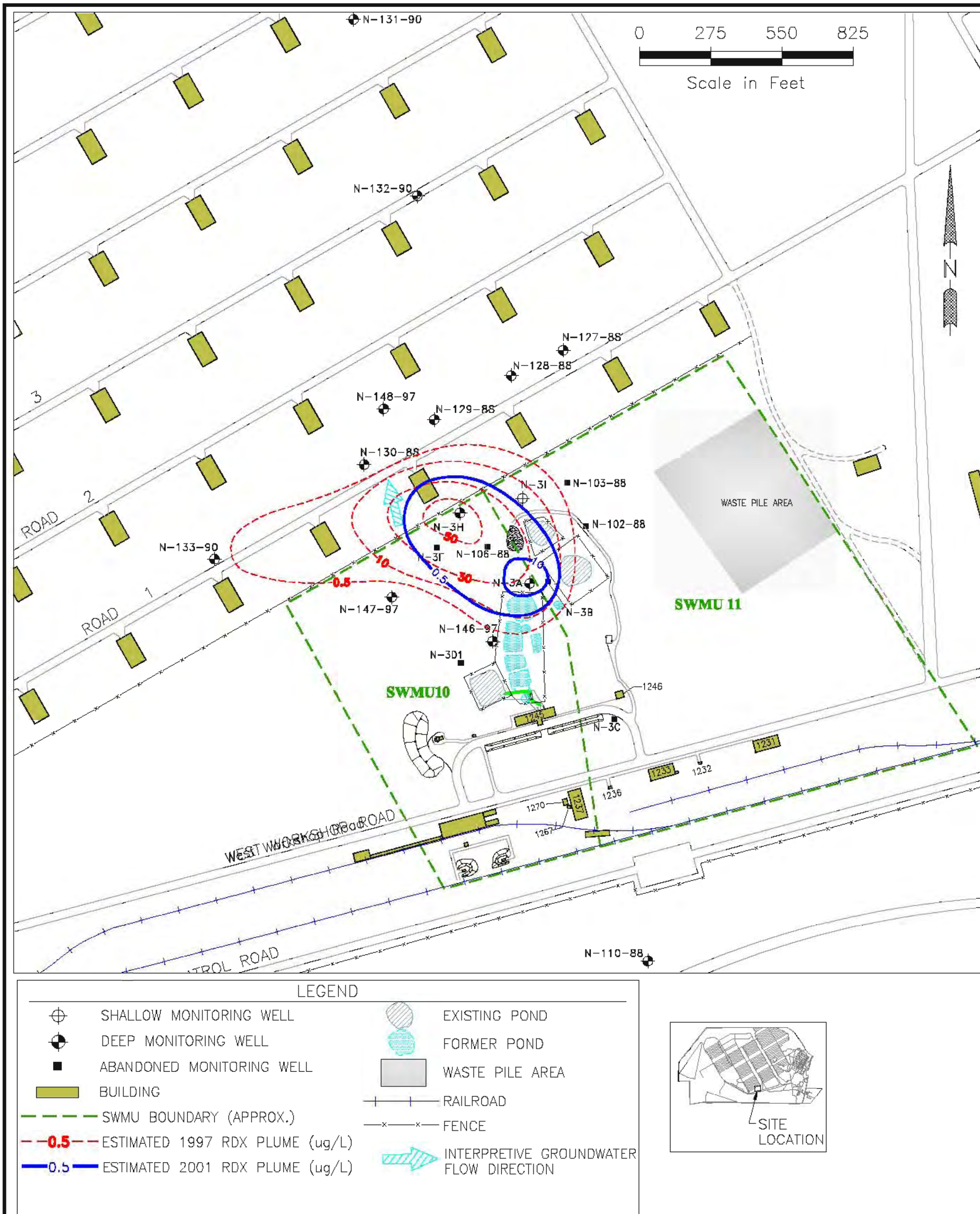

FIGURE 3-2
ESTIMATED EXTENT OF GROUNDWATER CONTAMINATION
SWMU 10
TOOELE ARMY DEPOT

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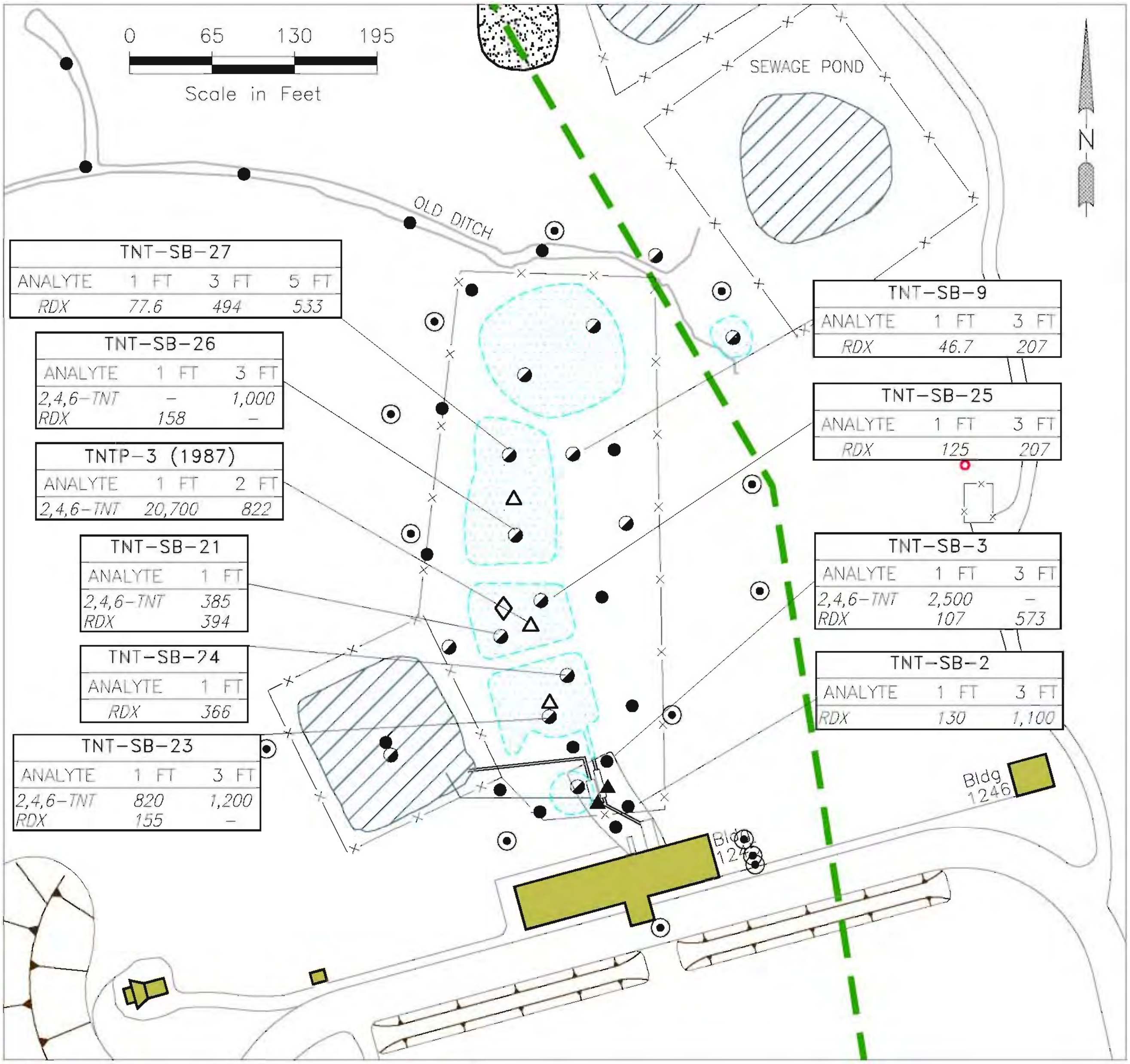

LEGEND

- SOIL BORING SAMPLE LOCATION
- SURFACE WATER SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION
- FENCE
- BUILDING
- SWMU BOUNDARY (APPROX.)
- EXISTING POND
- FORMER POND

RESULTS REPORTED IN ug/g

SOURCE: RUST E&I, 1995

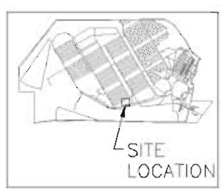

FIGURE 3-3
COC LOCATIONS,
PREVIOUS INVESTIGATIONS
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

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In the Phase II RFI (Rust E&I, 1995), the human health RA used the EPC – which represents the likely concentration that an individual is exposed to by working in the area of the SWMU – to calculate human health risks. The EPC for each identified COC in both surface and subsurface soil is compared to the respective CAO, as shown in the above table.

Based on this comparison, which is described in detail in the CMS Work Plan (Dames & Moore, 2000), the EPCs for RDX and 2,4,6-TNT in surface soil exceed the CAOs and result in unacceptable HI values for the realistic current and future land use scenarios. Based on these evaluations, the CMS Work Plan identifies active corrective measures (i.e., treatment technologies) as well as management measures to address these contaminants in both surface and subsurface soil.

In April 2002, additional soil samples were collected at SWMU 10 and analyzed for TNT and RDX to refine the horizontal and vertical extent of explosives contamination in shallow soils in and around the former ponds. Appendix E discusses these additional soil sampling activities. The sample locations were based on a sampling grid and a three step sampling program. Figure 3-4 presents the sampling grid. Sample locations with results above RDX or TNT CAOs are highlighted in yellow. Grid blocks corresponding to previous COC locations (see Figure 3-3) are also highlighted.

Based on the soil sampling described in the Phase II RFI (Rust E&I, 1995) and in Appendix E of this CMS, the total area and volume of contaminated soil to be evaluated for possible corrective measures are estimated to be 25,300 square feet (ft^2) and 5,000 cubic yards (yd^3), respectively. This volume of contaminated soil is split between three separate areas. An area of approximately 18,700 ft^2 covers most of the three southern most ponds between grid rows M and X. It is estimated that within this area, about 20 percent of the soil is contaminated to a depth of 9 feet bgs and the remaining 80 percent to a depth of 5 feet bgs. As a result, this area contains approximately 4,020 cubic yards (yd^3) of contaminated soil. An area of approximately 4,500 ft^2 covers a significant portion of the pond between grid rows H and M. The estimated depth of contaminated soil within this area is 5 feet bgs. This area contains approximately 830 yd^3 of contaminated soil. An area of approximately 2,100 ft^2 is located in the northern portion of the northern most pond between grid rows A and C. The estimated depth of contaminated soil within this area is 2 feet bgs. This area contains approximately 155 yd^3 of contaminated soil. These volumes are based on achieving military use CAOs. Figure 3-4 shows the estimated extent of contamination at SWMU 10 and the COC locations that helped define the extent of contamination.

In addition to the previously discussed quantitative CAOs, the CMS Work Plan (Dames & Moore, 2000) presented qualitative CAOs for SWMU 10 to comply with UAC R315-101, as follows:

- To protect other media (such as groundwater) from further degradation (i.e., to ensure that levels of contamination do not increase beyond existing levels, per UAC R315-101-3).

- To protect human health and the environment in accordance with Federal, State, and local regulatory requirements.

The CMS Work Plan (Dames & Moore, 2000) identified four alternatives to address explosives in soil and groundwater at SWMU 10, as noted below. A fifth alternative was added after the CMS Work Plan was finalized.

TNT WASHOUT FACILITY (SWMU 10)
Alternative 1: Excavation, composting, groundwater monitoring, and land use restrictions
Excavate former washout ponds, compost explosives-contaminated soil on post, and backfill with treated soil. Monitor identified contaminants in groundwater. Impose land use restrictions to prevent residential development.
Alternative 2: Excavation, composting, groundwater treatment, and land use restrictions
Excavate former washout ponds and compost explosives-contaminated soil on post. Extract contaminated groundwater and treat using granular activated carbon (GAC); reinject water. Impose land use restrictions to prevent residential development.
Alternative 3: Excavation, slurry-phase biological treatment, groundwater monitoring, and land use restrictions
Excavate former washout ponds and conduct on-post slurry-phase biological treatment of explosives-contaminated soil. Monitor identified contaminants in groundwater. Impose land use restrictions to prevent residential development.
Alternative 4: Excavation, off-post treatment/disposal, groundwater monitoring, and land use restrictions
Excavate former washout ponds, treat/dispose explosives-contaminated soil off post, and backfill with clean soil. Monitor identified contaminants in groundwater. Impose land use restrictions to prevent residential development.
Alternative 5: Multilayer cap, groundwater monitoring, and land use restrictions
Construct a multilayer cap over explosives-contaminated soil at former washout ponds. Monitor identified contaminants in groundwater. Impose land use restrictions to prevent residential development.

Table 3-1 summarizes the risks to human health and the environment evaluated in the Phase II RFI (Rust E&I, 1995) and the SWERA (Rust E&I, 1997), and the corrective

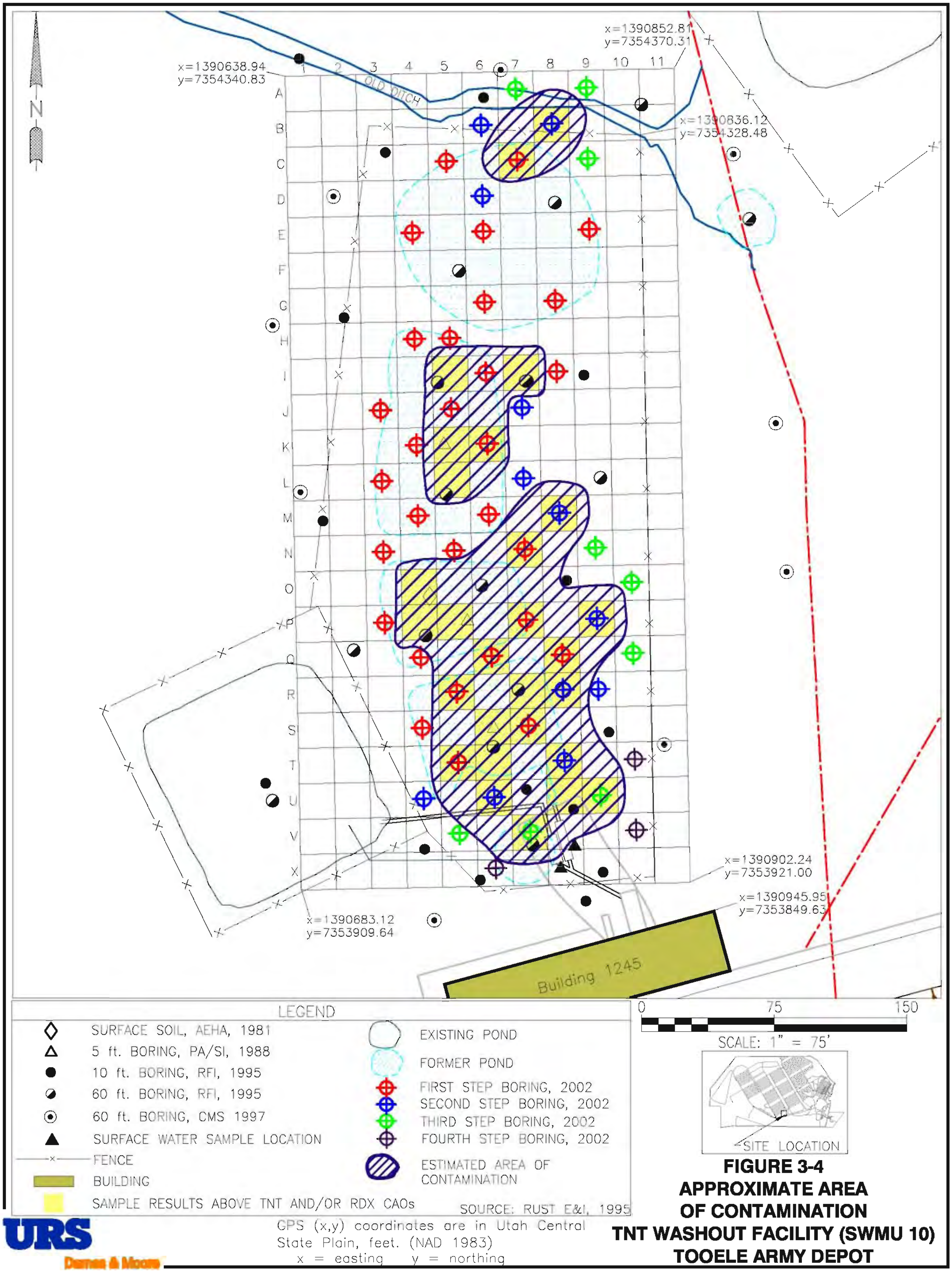

FIGURE 3-4
APPROXIMATE AREA OF CONTAMINATION
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

TABLE 3-1

Summary of Human Health and Environmental Risks
TNT Washout Facility (SWMU 10)

Phase II RFI (Rust E&I, 1995)									SWERA (Rust E&I, 1997)	CMS Work Plan (Dames & Moore, 1999)	
Human Health Risk Assessment (a)								Impacts to Groundwater	Ecological Risk	COCs	Corrective Measures Alternatives (b)
Residential Land Use Scenario (c)				Realistic Future Land Use Scenario (d)							
	Risk	HI	Blood Lead Level (e)		Risk	HI	Blood Lead Level (e)				
Adult	**2.5×10^{-2}**	**2,500**	NE (f)	Military	1.3×10^{-5}	**2.1**	NE	Yes (g)	Unacceptable risks due to RDX in vegetative material	Surface soil: 2,4,6-TNT RDX Subsurface soil: 2,4,6-TNT RDX	***Excavation, composting, groundwater monitoring, and land use restrictions*** Excavation, composting, groundwater treatment, and land use restrictions Excavation, slurry-phase biological treatment, groundwater monitoring, and land use restrictions Excavation, off-post treatment/ disposal, groundwater monitoring, and land use restrictions Multilayer cap, groundwater monitoring, and land use restrictions
Child	**1.3×10^{-2}**	**6,600**	NE	Construction	6.1×10^{-7}	**12**	NE				

(a) Risks, HIs, and blood lead levels that are above comparison levels appear in bold type. Maximum values reported.
(b) The recommended corrective measures alternative appears in bold italic type.
(c) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the residential land use scenario. Because risks, HIs, or blood lead levels are greater than 1×10^{-6}, 1, or 10 µg/L, respectively, EPA guidance and UAC R315-101-6(c)(3) state that a CMS must be performed.
(d) EPA guidance and UAC R315-101-5.2(b)(1) require evaluation of the realistic future land use scenario. Because HIs at SWMU 10 are greater than 1, UAC R315-101-6(e) indicates that corrective actions must be evaluated.
(e) Blood lead levels are expressed as micrograms per deciliter (µg/dL) for 95 percent of the population. CDC defines a limit of 10 µg/dL for the protection of children.
(f) NE = pathway incomplete or not evaluated; see CMS Work Plan (Dames & Moore, 2000).
(g) No COCs were identified for groundwater because there is no complete exposure pathway.

measures alternatives identified for SWMU 10 in the CMS Work Plan (Dames & Moore, 2000).

3.2 DETAILED EVALUATION OF CORRECTIVE MEASURES ALTERNATIVES

Section 3.1.2 evaluates the five corrective measures alternatives for the TNT Washout Facility (SWMU 10). Each of the alternatives includes land use restrictions, which are described in detail in Section 3.2.1.

3.2.1 Alternative 1 – Excavation, Composting, Groundwater Monitoring, and Land Use Restrictions

This alternative involves the excavation and screening of approximately 5,000 yd^3 of explosives-contaminated soil, followed by on-post composting, backfilling of treated soil, and covering treated material with clean soil from an on-post source. The composting alternative design is based on a composting treatability study conducted at SWMU 10 (Dames & Moore, 1998).

This alternative calls for excavating the contaminated soil in batches. A soil berm is placed around the excavated areas to prevent runoff from entering the areas. Each excavated area is covered with a plastic liner until backfilled with treated material. Prior to and during excavation, large debris such as broken pipe is removed and disposed of properly. The existing PVC liner is removed and disposed of wherever excavation occurs. Confirmatory soil samples are collected from the floor and sidewalls of each excavation. Material greater than 1 inch in size is separated using a vibrating screen and returned to the excavation. The surface vegetation will also be composted. Four windrows – each approximately 10 feet wide, 265 feet long, and 5 feet high – are constructed of: soil (30 percent by volume), wood chips (10 percent), alfalfa (15 percent), lettuce (10 percent), barley (10 percent), cow manure (20 percent), and chicken manure (5 percent). The windrows are constructed on an asphalt pad (Figures 3-5 and 3-6) according to the specifications given in Appendix A (Section A.1.1.1). It is estimated that approximately 6,000 gallons of water will be applied to the composted material per batch. Experience has shown that the water will be used up by the composing process and not drain off from the windrows. It is estimated that approximately 300 gallons of molasses will be applied per batch.

Composting is conducted in 18 batches, each involving 15 days of treatment and 10 days to test and stockpile the completed compost and construct new windrows. Samples of excavated soil are collected on Day 0 and samples of compost material are collected on Day 15 for each batch and analyzed for explosives. The composted soil is then aged for up to three months before it is placed back into the excavated area. The composted soil is aged at the asphalt pad or similar area. Samples from the treated compost are analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) parameters before backfilling; material with residual explosives or which fails TCLP will be recomposted until TCLP is met. A 6-inch soil cover using clean non-treated soil is placed over the backfilled treated soil. The cover will be allowed to vegetate naturally.

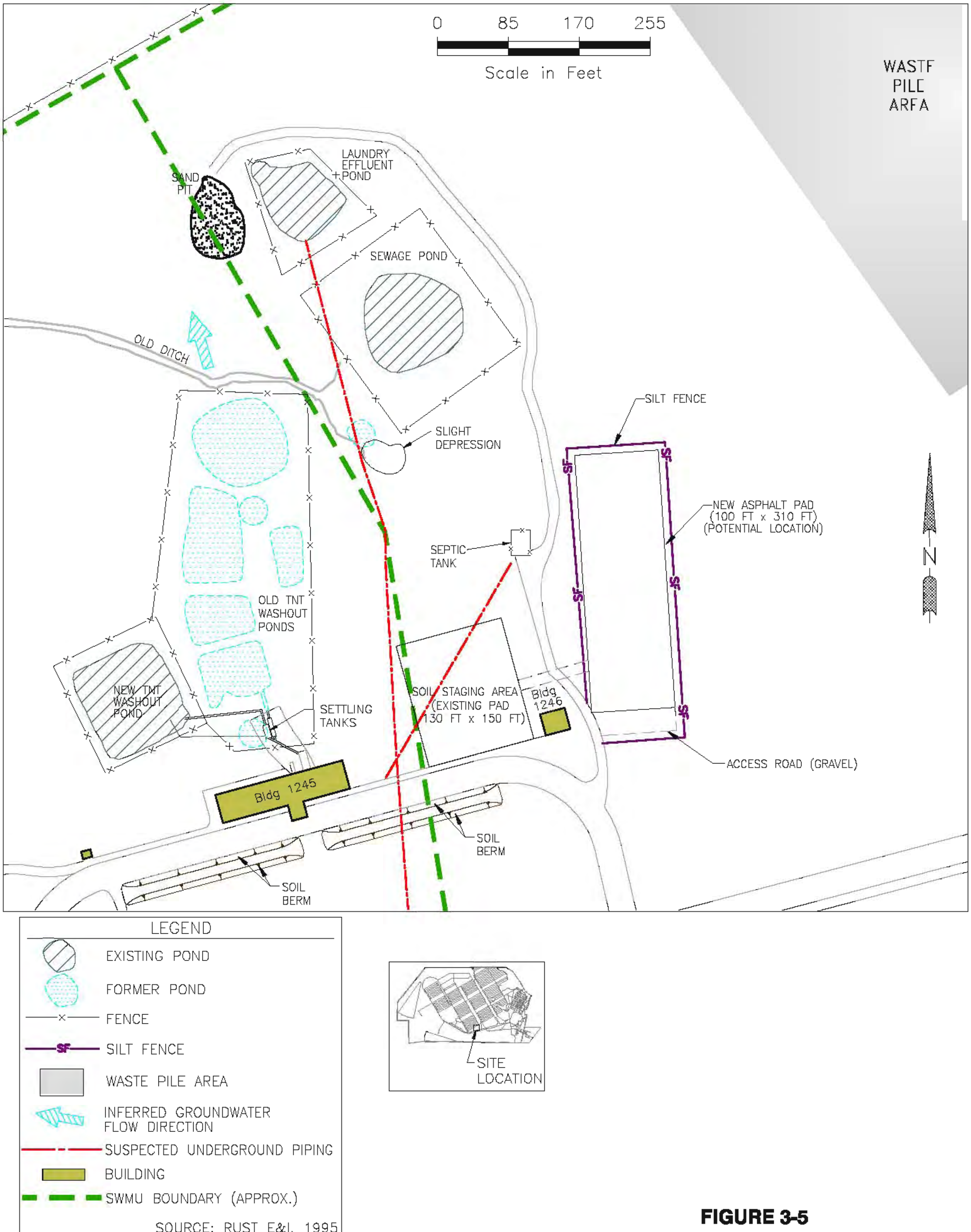

FIGURE 3-5
FULL-SCALE COMPOSTING LAYOUT
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

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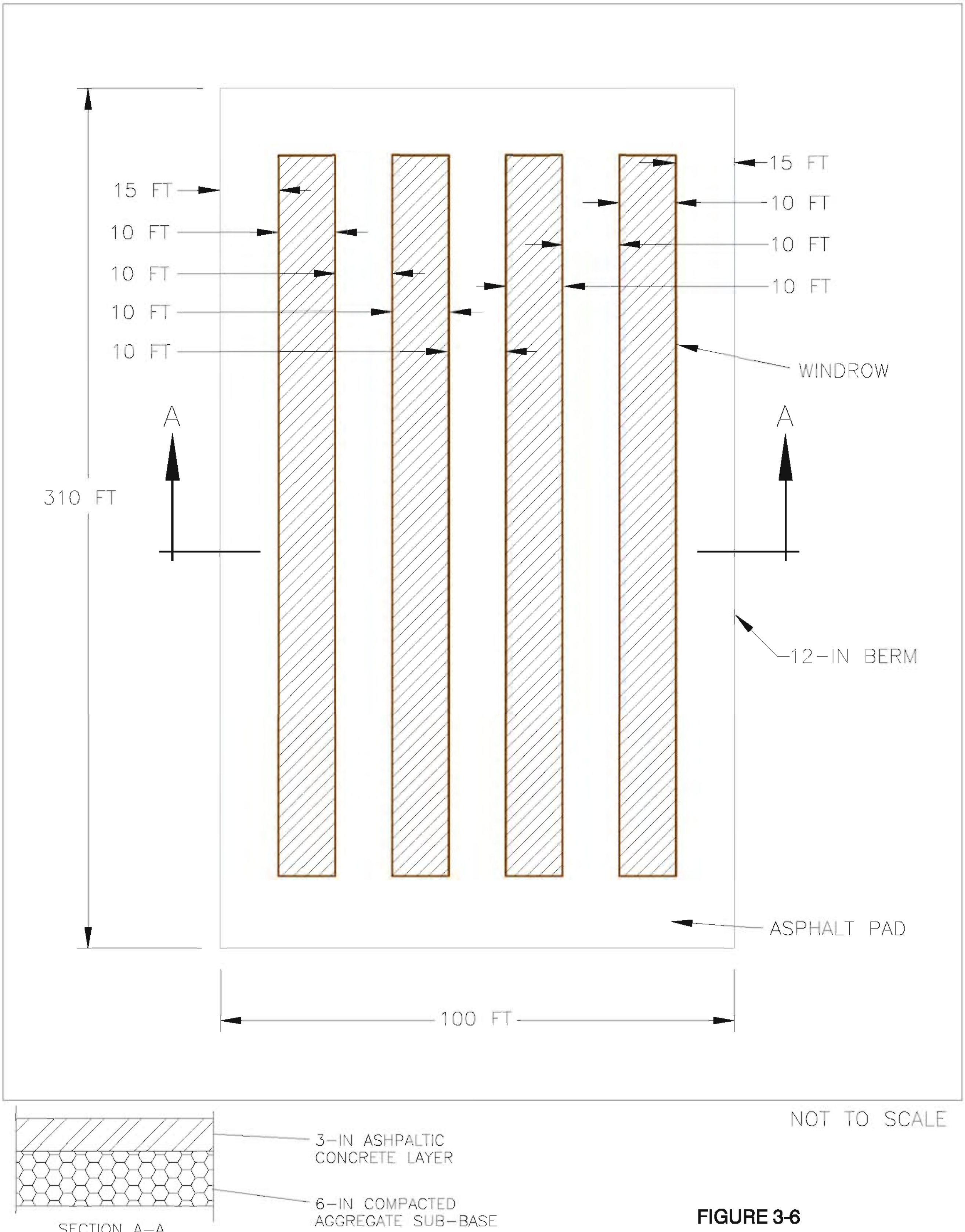

FIGURE 3-6
COMPOSTING SITE PLAN
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

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The cover is designed to prevent surface water ponding, to minimize erosion, and to accommodate slope stability concerns.

This alternative also includes groundwater monitoring of the explosives plume. Groundwater modeling conducted for the RDX plume shows that the RDX plume is nearing steady state, and is not predicted to migrate beyond the installation boundary (Volume III of the Draft Known Releases CMS Report). The results predict that the plume will not reach downgradient monitoring well N-132-90 after 500 years despite the very conservative assumption that a long term source remains in place. (Composting would mitigate the source.) This long-term source presumably contributes to the model plume's persistence. The primary reason for the very slow migration of the plume is that the hydraulic gradient is extremely shallow, and the hydraulic conductivity is low, hence the very slow movement of groundwater. As discussed in Appendix B, RDX concentrations will slowly decrease over time through natural attenuation processes such as dispersion, dilution, and sorption. However, the conditions for the RDX plume do not appear to be favorable enough for natural attenuation to be considered an active source of groundwater remediation. Therefore, this alternative includes a groundwater monitoring program at SWMU 10 to monitor and document the movement, if any, of the RDX plume.

The monitoring program will consist of semi-annual sampling for RDX and 2,4,6-TNT in wells N-3H, N-3A, and N-148-97. Wells N-133-90, N-129-88, N-130-88 and N-132-90 will be sampled annually. The perched zone (well N-3I) will be sampled every two years, if enough water can be recovered to purge, followed by sampling 24 hours later. Figure 3-7 presents the proposed monitoring well locations.

At the end of each year of monitoring, a statistical analysis will be performed. The details of the monitoring plan, and evaluation protocol for statistical testing will be developed in the Corrective Measures Implementation Plan (CMIP). Regulatory input and approval of the CMIP will focus the monitoring requirements to fulfill statistical objectives. The annual reports will also evaluate the current plume conditions and note any downgradient migration of the plume. Plume reduction processes such as natural attenuation will be evaluated. A statistical trend analysis will be performed on the RDX concentrations in groundwater to see whether concentrations are decreasing over time. The statistical analysis of sampling results will be used to determine when further monitoring is no longer necessary. The groundwater modeling is based on the very conservative assumption of long term continuing source and overestimates how long monitoring will be required. Composting effectively removes that source, therefore, for cost estimating purposes, the groundwater program is estimated to run for 8 years.

A contingency plan will also be developed for this alternative. The contingency plan will include any necessary strategies in the event that the plume migrates downgradient faster than predicted. If a situation existed that would require the implementation of the contingency plan, it would be necessary to install additional groundwater monitoring wells around the perimeter of the plume and farther downgradient. The need for corrective actions such as groundwater extraction and treatment would also be reevaluated.

The final component of this alternative is the application of land use restrictions to prevent groundwater use and future residential use of the site. The groundwater use restrictions would extend to the area affected by the SWMU 10 plume including beneath SWMU 11. These restrictions would be incorporated into TEAD's master land use plan. This plan also calls for inspections and monitoring to ensure the restrictions are being observed. Because U.S. Army regulations direct that all revisions to the plan be evaluated with regard to potential impacts to human health and the environment, unauthorized future use (i.e., residential) of SWMU 10, or transfer under BRAC, requires the resolution of conflicts between identified risks and hazards and proposed changes in land use at the site.

The real property planning board has authority over land use at the depot, and is responsible for developing, enforcing, and modifying the installation's master land use plan. The authority of the board is derived from the responsible major Army command (i.e., OSC), which has specific oversight functions. These responsibilities include approving the installation's master land use plan and any proposed changes. Appendix B of the CMS Work Plan (Dames & Moore, 2000) presents a more detailed description of land use restrictions.

Appendix A outlines the design and cost assumptions for this alternative.

Alternative 1 – excavating, composting, groundwater monitoring, and land use restrictions – is evaluated as follows:

- Technical criteria

  – Performance – The composting treatability study at TEAD showed that composting reduces contaminant concentrations in soil to below quantitative CAOs in a reasonable amount of time (i.e., 15 days per batch), thus meeting the requirements of UAC R315-101 (Dames & Moore, 1998). Approximately 1.25 years is required to treat the 5,000 yd^3 of explosives-contaminated soil. Together, soil composting and land use restrictions meet the qualitative CAOs (and UAC R315-101) by limiting continued impacts to groundwater beyond existing contaminant levels and by protecting human health and the environment.

    The SESOIL (**SE**asonal **SOIL**) model was performed to estimate whether cleaning soil to Depot Worker CAOs will prevent an increase in existing levels of groundwater contamination (Appendix D). The model predicts that TNT and RDX leachate from the remediated soil will not increase existing levels of groundwater contamination over the course of the model (200 years).

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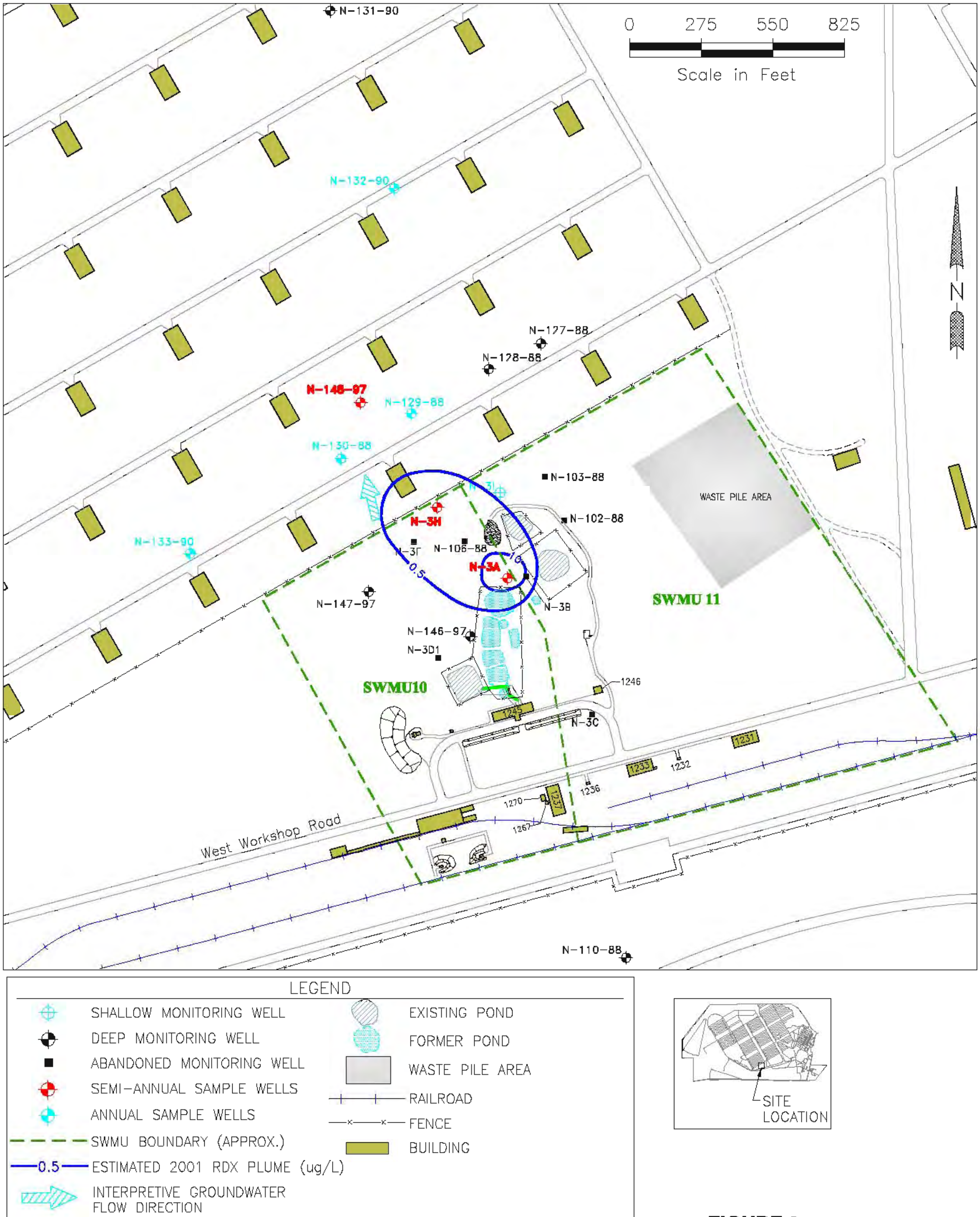

FIGURE 3-7
MONITORING WELLS TO BE SAMPLED
DURING YEARLY SITE REVIEWS
TNT WASHOUT FACILITY - SWMU 10
TOOELE ARMY DEPOT

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Research studies, as well as composting studies at TEAD and Hawthorne Army Ammunition Plant (AAP) in Nevada, have shown that TNT intermediate breakdown products (such as amino-dinitrotoluenes and diamino-nitrotoluenes) are reduced to concentrations below detection limits under aerobic composting conditions in a reasonable amount of time (Weston, 1993; Dames & Moore, 1998; Soutiere, 1998).

Groundwater modeling conducted at SWMUs 10 and 11 (as described in Volume III of the Draft Known Releases SWMUs CMS Report (Dames & Moore, 2000a)) shows that the RDX plume is nearing steady state and is not predicted to migrate very far beyond its current location which is several miles from the installation boundary. Natural attenuation processes, such as dilution and dispersion, are likely to reduce RDX concentrations in groundwater. RDX groundwater concentrations have decreased steadily from 1997 to 2001.

This alternative reduces the toxicity and mobility of explosives detected in soil at SWMU 10. It meets the identified goals with no decrease in effectiveness over time.

– <u>Reliability</u> – Studies at TEAD and other sites have shown composting to be a reliable method to permanently reduce explosives contamination in a reasonable amount of time (i.e., 15 days). This alternative permanently destroys explosives through mineralization and biotransformation. Berms blocking prevailing winds will be constructed to prevent windblown dust at the composting area. At the end of full-scale soil composting, waste materials management is required, but it consists only of land deposition in accordance with UAC R315-13, Land Disposal Regulations. As demonstrated in the TEAD treatability study (Dames & Moore, 1998), the composted soil will meet both military and residential cleanup levels and can be placed at SWMU 10 or in clean areas if desired. Because the extent of soil excavation is based on military use CAOs, land use restrictions to prevent residential development at the site itself will be necessary. Land use restrictions are effective over the long term and have been implemented at many sites with positive results.

Groundwater modeling has predicted that the RDX plume will not migrate very far beyond its current location and processes such as dilution and dispersion are likely to reduce contaminant concentrations in groundwater.

Long-term environmental monitoring is required for groundwater to document that the plume migration meets the outcome predicted by modeling. A contingency plan will be enacted if this is not the case.

- Implementability – As demonstrated in the TEAD treatability study (Dames & Moore, 1998), this corrective measures alternative is technically and administratively feasible at SWMU 10. Site preparation, including the construction of a temporary structure and asphalt pad and berms, can be accomplished in a reasonable amount of time. Amendments and materials-handling equipment are readily available. Existing wells may be used for groundwater monitoring. Because the specified future land use for SWMU 10 is military, continuing land use restrictions at this site should not be difficult.

- Safety – Because the activities associated with composting are conducted on post, this alternative poses no health risks to off-post residential communities. Workers involved in the implementation of Alternative 1 may be exposed to explosives-contaminated soil and groundwater. The use of proper personal protective equipment (PPE), as well as other protective measures such as dust suppression and monitoring, minimizes health risks to workers. Explosives material at concentrations exceeding 10 percent (i.e., reactive material) is not expected to be encountered during composting. Ventilation systems within the composting building minimize the accumulation of hazardous gases, such as ammonia, in the unlikely event they are produced, and should aid in increasing visibility immediately after turning operations. No workers are to be allowed in the building while the windrow turner is operating because material may be thrown from it during mixing operations. No significant chemical or physical hazards are expected for workers involved in groundwater monitoring.

- Human health assessment – Excavation and treatment of explosives-contaminated soil protect human health by reducing the concentrations of explosives in soil below quantitative CAOs. Composting degrades explosives and their potentially toxic intermediate breakdown products, and any resulting product is essentially nonextractable. The toxicity of all resulting end products has not been determined, but they are considered to be relatively innocuous in a subsurface environment because of their nonleachability. No intermediate 2,4,6-TNT breakdown products, such as amino-dinitrotoluenes, were detected at the completion of treatability studies at TEAD or Hawthorne AAP (Dames & Moore, 1998; Soutiere, 1998).

  The removal and treatment of contaminated soil through composting reduces the risk of long-term exposure of military personnel to explosives. The groundwater is not a source of drinking water and groundwater monitoring will document any plume migration. A contingency plan will be enacted if the plume migrates beyond the range expected from modeling. A residual risk remains onsite from soil contamination at concentrations below military use CAOs but above residential use CAOs. Restricting future development of the site also protects human health by preventing residential exposure to soil and groundwater contaminants.

- Environmental assessment – The excavation and treatment of explosives-contaminated soil reduce the risk to ecological receptors by limiting exposure to contaminated soil at the site. Moreover, the ecological risk derives from RDX in vegetative matter within the SWMU boundary. Therefore, all vegetation removed during grubbing of the site will be composted with the soil, thus reducing all ecological risks. See Appendix C.

- Administrative feasibility – This alternative complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101, by preventing residential exposure to explosives-contaminated soil and groundwater. Contaminated soil is excavated in accordance with the requirements of UAC R307-12, Fugitive Emissions and Fugitive Dust. Composting is conducted in accordance with regulations governing solid and special waste identification, handling, treatment, storage, and disposal, as contained in Utah Solid and Hazardous Waste Regulations. If the excavated soil is characterized as hazardous – which is not likely based on experience at SWMU 10 – it is handled in accordance with applicable Federal and State regulations. Groundwater is monitored in accordance with Utah groundwater quality protection regulations.

- Cost – The estimated present worth cost of implementing this corrective measures alternative is $2,470,000. Table A-1 (Appendix A) presents the detailed cost estimate.

3.2.2 Alternative 2 – Excavation, Composting, Groundwater Treatment, and Land Use Restrictions

The excavation, composting, and backfilling of treated soil proposed in Alternative 2 are the same as that described in Section 3.2.1 for Alternative 1.

Alternative 2 also includes the extraction and treatment of contaminated groundwater using GAC. Three wells are used to extract groundwater, at a total flow rate of 100 gallons per minute. Based on the results of a groundwater extraction model conducted as part of this CMS (see Appendix B), the well locations were shown to effectively capture the contaminated groundwater plume. For purposes of this CMS, groundwater is to be extracted from three 6-inch diameter PVC wells installed to a depth of 350 feet bgs. Figure 3-8 shows typical extraction well details. Treated water is reinjected using three 5-inch diameter infiltration wells, each approximately 150 feet deep. Figure 3-9 shows typical injection well details. Optimization of groundwater pumping and reinjection will require a pump test to determine local groundwater flow parameters, specifically, hydraulic conductivity. (Current data include only a local slug test).

Prior to treatment, the extracted groundwater is filtered and stored in an equalization tank. The filtered water is treated using two 1,700-pound preassembled, skid-mounted, downflow carbon adsorbers placed in series (Figure 3-10). Used carbon is stored in 55-gallon drums and disposed in a Subtitle C landfill. The treatment system is installed inside a temporary structure to avoid freezing during winter operations.

Additional testing is required prior to final design of the pump-and-treat system. Short-term pilot tests are necessary to determine the adsorptive capacity of activated carbon. In addition, aquifer tests are needed to determine local aquifer transmissivity and specific yield or storage coefficient.

To document the performance of the pump and treat program, monitoring of groundwater will include analysis for VOCs from strategic wells across the site. The monitoring program will be the same as for Alternative 1 described in Section 3.2.1. It is assumed that the pump and treat system will operate until the groundwater explosives concentrations have been show to decrease consistently for five consecutive sampling periods using statistical methods agreed to by the U.S. Army, EPA, and UDEQ. For cost estimating purposes, the groundwater extraction program is estimated to run for 8 years.

The final component of Alternative 2 is the application of land use restrictions, as described in Section 3.2.1.

Appendix A outlines the design and cost assumptions for this alternative.

Alternative 2 – excavation, composting, groundwater treatment, and land use restrictions – is evaluated as follows:

- <u>Technical criteria</u>

  – <u>Performance</u> – The composting treatability study (Dames & Moore, 1998) showed that composting reduces contaminant concentrations in soil to below quantitative CAOs in a reasonable amount of time (i.e., 15 days per batch), thus meeting the requirements of UAC R315-101. Approximately 1.25 years is required to treat the 5,000 yd^3 of explosives-contaminated soil. Together, soil composting and land use restrictions meet the qualitative CAOs (and UAC R315-101) by limiting continued effects on groundwater beyond existing contaminant levels and by protecting human health and the environment.

    Research studies, as well as composting studies at TEAD and Hawthorne AAP, have shown that TNT intermediate breakdown products (such as amino-dinitrotoluenes and diamino-nitrotoluenes) are reduced to concentrations below detection limits under aerobic composting conditions in a reasonable amount of time (Weston, 1993; Dames & Moore, 1998; Soutiere, 1998).

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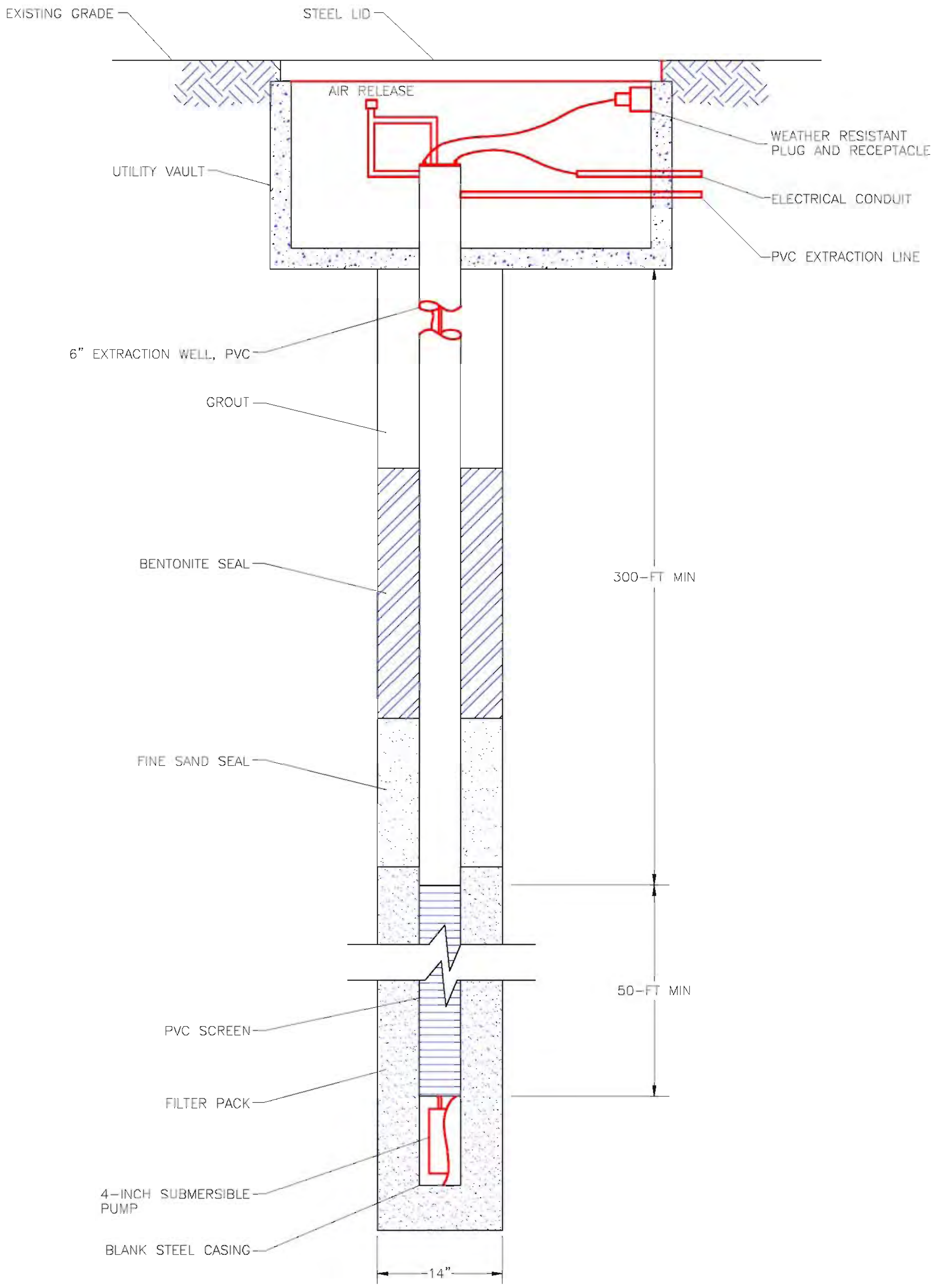

FIGURE 3-8
TYPICAL EXTRACTION WELL
(SWMU 10)
TOOELE ARMY DEPOT

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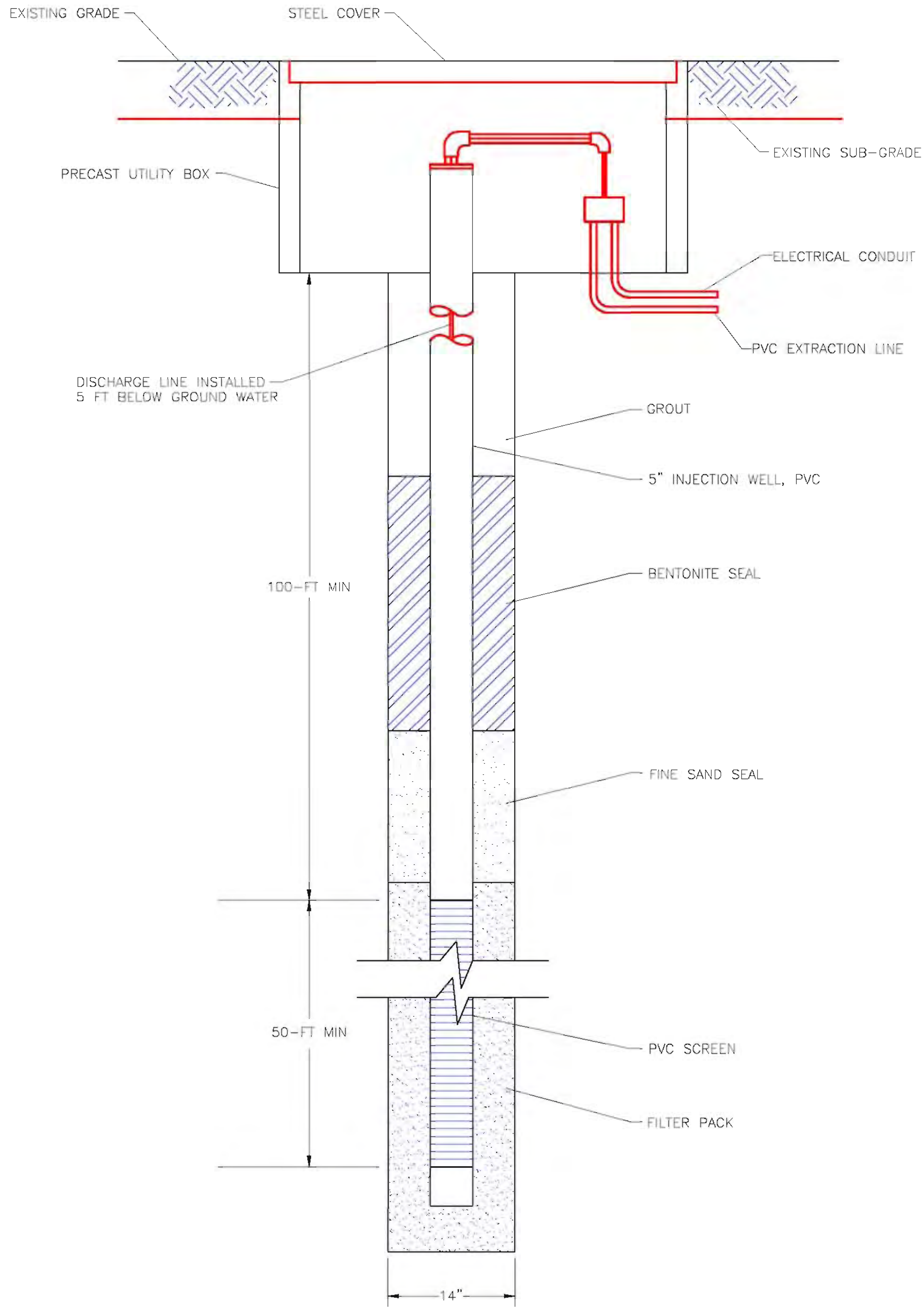

FIGURE 3-9
TYPICAL REINJECTION WELL
(SWMU 10)
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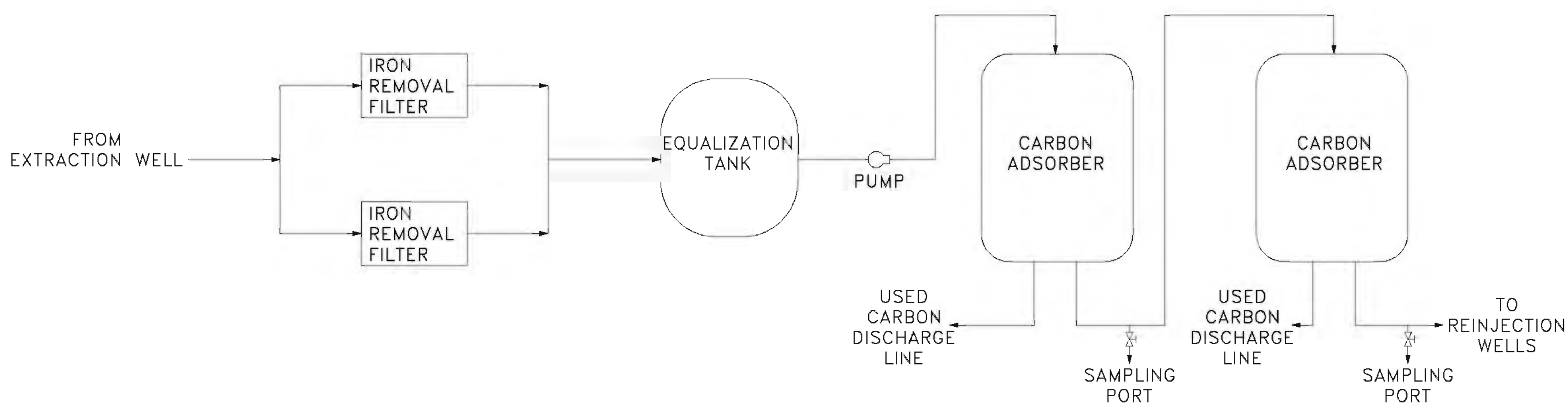

FIGURE 3-10
GROUNDWATER EXTRACTION AND TREATMENT
CARBON ADSORPTION PROCESS FLOW CHART
(SWMU 10)
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Extraction and treatment of contaminated groundwater ensures the plume is contained. However, groundwater modeling conducted for the RDX plume shows that even without corrective measures the RDX plume is nearing steady state and is not predicted to migrate very far beyond its current location which is several miles from the installation boundary.

This alternative reduces the toxicity and mobility of explosives detected in soil at SWMU 10. The treatment of soil and groundwater and the implementation of land use restrictions comply with UAC R315-101. Groundwater extraction and treatment reduce the toxicity, volume, and mobility of RDX in groundwater. Thus, Alternative 2 meets the identified goals with no decrease in effectiveness over time.

– <u>Reliability</u> – Studies at TEAD and other sites have shown composting to be a reliable method to permanently reduce explosives contamination in a reasonable amount of time (i.e., 15 days). This alternative permanently destroys explosives through mineralization and biotransformation. At the end of full-scale soil composting, waste materials management is required, but it consists only of land deposition in accordance with UAC R315-13, Land Disposal Regulations. As demonstrated in the TEAD treatability study (Dames & Moore, 1998), the composted soil will meet both military and residential cleanup levels and can be placed at SWMU 10 or in clean areas if desired. Because the extent of soil excavation is based on military use CAOs, land use restrictions to prevent residential development at the site itself will be necessary. Land use restrictions are effective over the long term and have been implemented at many sites with positive results.

  Groundwater modeling has predicted that the RDX plume will not migrate very far beyond its current location and groundwater extraction will further contain the plume. Groundwater extraction and carbon adsorption are effective over the long term and have been implemented at many sites with positive results. Environmental monitoring is required for groundwater to confirm that the plume is treated and contained.

  For cost estimation purposes, groundwater extraction and treatment are estimated to require 8 years. Spent carbon is periodically removed and disposed off post because it is not likely that it can be regenerated or reactivated. A treatment and disposal facility is located within 100 miles of TEAD.

  Extracted groundwater containing RDX has been treated using carbon adsorption with success but RDX does not adsorb to carbon as well as other common contaminants, resulting in increased O&M costs. The existing Industrial Waste Lagoon (SWMU 2) pump and treat system has operational difficulties with corrosion due to the corrosive nature of the groundwater.

- Implementability – This corrective measures alternative is technically and administratively feasible at SWMU 10. The TEAD treatability study (Dames & Moore, 1998) demonstrated the feasibility of composting, and vertical recovery wells have been successfully used to remediate groundwater at TEAD. A pump test is needed to design the extraction system. Because the specified future land use for SWMU 10 is military, continuing land use restrictions at this site should not be difficult.

- Safety – Because the activities associated with composting and groundwater extraction and treatment are conducted on post, this alternative poses no health risks to off-post residential communities. The transport of spent carbon to the treatment and disposal facility is not expected to pose risks to off-post communities because of the small quantities of carbon and low RDX concentrations.

  Workers involved in the implementation of Alternative 2 may be exposed to explosives-contaminated soil and groundwater. However, the use of proper PPE, as well as other protective measures such as dust suppression and monitoring, minimizes health risks to workers. Explosives material at concentrations exceeding 10 percent (i.e., reactive material) is not expected to be encountered during composting. Ventilation systems within the composting building minimize the accumulation of hazardous gases, such as ammonia, and should aid in increasing visibility after turning operations. No workers are to be allowed in the building while the windrow turner is operating because material may be thrown from it during mixing operations.

- Human health assessment – Excavation and treatment of explosives-contaminated soil protect human health by reducing long-term exposure, as further detailed in Section 3.2.1. Both soil composting and groundwater treatment reduce the risk of long-term exposure of military personnel to explosives. The removal and treatment of contaminated soil prevent human contact with contaminants and eliminate the possibility of contaminant migration. The local groundwater is not a source of drinking water and groundwater extraction and treatment will ensure the plume does not migrate beyond its current location. The residual risk remaining onsite for soil results from soil contamination at concentrations below military use CAOs but above residential use CAOs. Restricting future development of the site also protects human health by preventing residential exposure to soil and groundwater contaminants.

- Environmental assessment – The excavation and treatment of explosives-contaminated soil reduces the risk to ecological receptors by limiting exposure to contaminated soil at the site. Moreover, the ecological risk derives from RDX in vegetative mater within the SWMU boundary. Therefore, all vegetation removed during grubbing of the site will be composted with the soil, thus reducing all ecological risks. See Appendix C.

- Administrative feasibility – This alternative complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101, by preventing residential exposure to explosives-contaminated soil and groundwater. Contaminated soil is excavated in accordance with the requirements of UAC R307-12, Fugitive Emissions and Fugitive Dust. Composting is conducted in accordance with regulations governing solid and special waste identification, handling, treatment, storage, and disposal, as contained in Utah Solid and Hazardous Waste Regulations. If the excavated soil is characterized as hazardous – which is not likely based on experience at SWMU 10 – it is handled in accordance with applicable Federal and State regulations. Groundwater extraction is conducted in accordance with Utah groundwater quality protection regulations.

- Cost – The estimated present worth cost of implementing this corrective measures alternative is $4,450,000. Table A-2 (Appendix A) presents the detailed cost estimate.

3.2.3 Alternative 3 – Excavation, Slurry Phase Biological Treatment, Groundwater Monitoring, and Land Use Restrictions

This alternative involves the excavation of approximately 5,000 yd^3 of contaminated soil, slurry phase biological treatment of the soil, and dewatering followed by land disposal of the treated solid material. Figure 3-11 shows the full-scale treatment layout.

The contaminated soil is excavated in batches. A soil berm is placed around the excavated areas to prevent runoff from entering the areas. Each excavated area is covered with a plastic liner until backfilled with treated material. Prior to and during excavation, large debris such as broken pipe is removed and disposed of properly. The existing PVC liner is removed wherever excavation occurs. Confirmatory soil samples are collected from the floor and sidewalls of each excavation. Large solid material is separated using a vibrating screen; it is washed and returned to the excavation. The washwater is used in preparation of the soil slurry. Two concrete pads are constructed for the treatment and dewatering of soil, with the treatment system constructed as shown in Figure 3-12. Vegetation will potentially need to be disposed of at an off-post treatment/ disposal facility.

Slurry-phase biological treatment can be conducted only when the outside temperature is above 25 degrees Celsius (°C), which in Tooele occurs about 9 months each year. Treatment can be conducted in a mixing tank or a lined lagoon. A lagoon will require a RCRA-type liner including a clay layer, a geomembrane, and potentially a leachate collection system. A lagoon system may result in hard to mix "dead spots" and difficulty removing all of the slurry by pumping. Mechanical removal equipment may rip the liner. Also, wildlife exposure and extra unnecessary water from rain will be difficult to restrict with a lagoon system. Therefore, a mixing tank is the preferred treatment system. The contaminated soil at SWMU 10 is treated in 9 batches – each involving 4 weeks of treatment and 2 additional weeks to prepare the slurry, load and unload the reactors, and dewater the treated slurry. The treatment process proceeds as follows:

- Each batch is prepared in a slurry mixing tank and then transferred to the reactors. The slurry consists of 40 percent soil by weight. Sodium hydroxide is used as needed to control pH. Molasses is used as a substrate for the bioremediation process.

- Treated slurry is dewatered using a belt filter press, followed by transfer of the dewatered material to a lagoon for further drying.

- Water is generally recycled; however, the final batch each year is disposed of off post at a RCRA Subtitle C facility.

- The dried soil is transferred to excavated areas of the washout ponds.

- Clean non-treated soil from an onsite source is used to complete backfilling as needed.

- A 6-inch compacted soil cover is placed over the backfilled area. The cover will be allowed to vegetate naturally. The cover is designed to prevent ponding, to minimize erosion, and to accommodate slope stability concerns.

Two slurry processes are currently commercially available – one operates in an aerobic/anoxic sequence and is known as the Argonne process (Argonne, 1996); and the other operates anaerobically and is known as the Simplot anaerobic bioremediation (SABRE) technology (USEPA, 1995). In both processes, organic contaminants in soil are biodegraded by naturally occurring microorganisms, with the resulting formation of inorganic and organic byproducts.

- To optimize total explosives degradation, the Argonne process intermittently supplies air to the slurry mixture to permit reactor conditions to cycle between aerobic and anoxic states. In addition, the slurry is mixed frequently to prevent settling of the particulate material.

- To create highly reducing conditions, the SABRE method quickly establishes anaerobic conditions, and a carbon source is added to the slurry. Mixing is limited to reduce the introduction of oxygen.

There are some questions concerning the types of intermediate breakdown products formed during each of these slurry processes. Some laboratory research studies

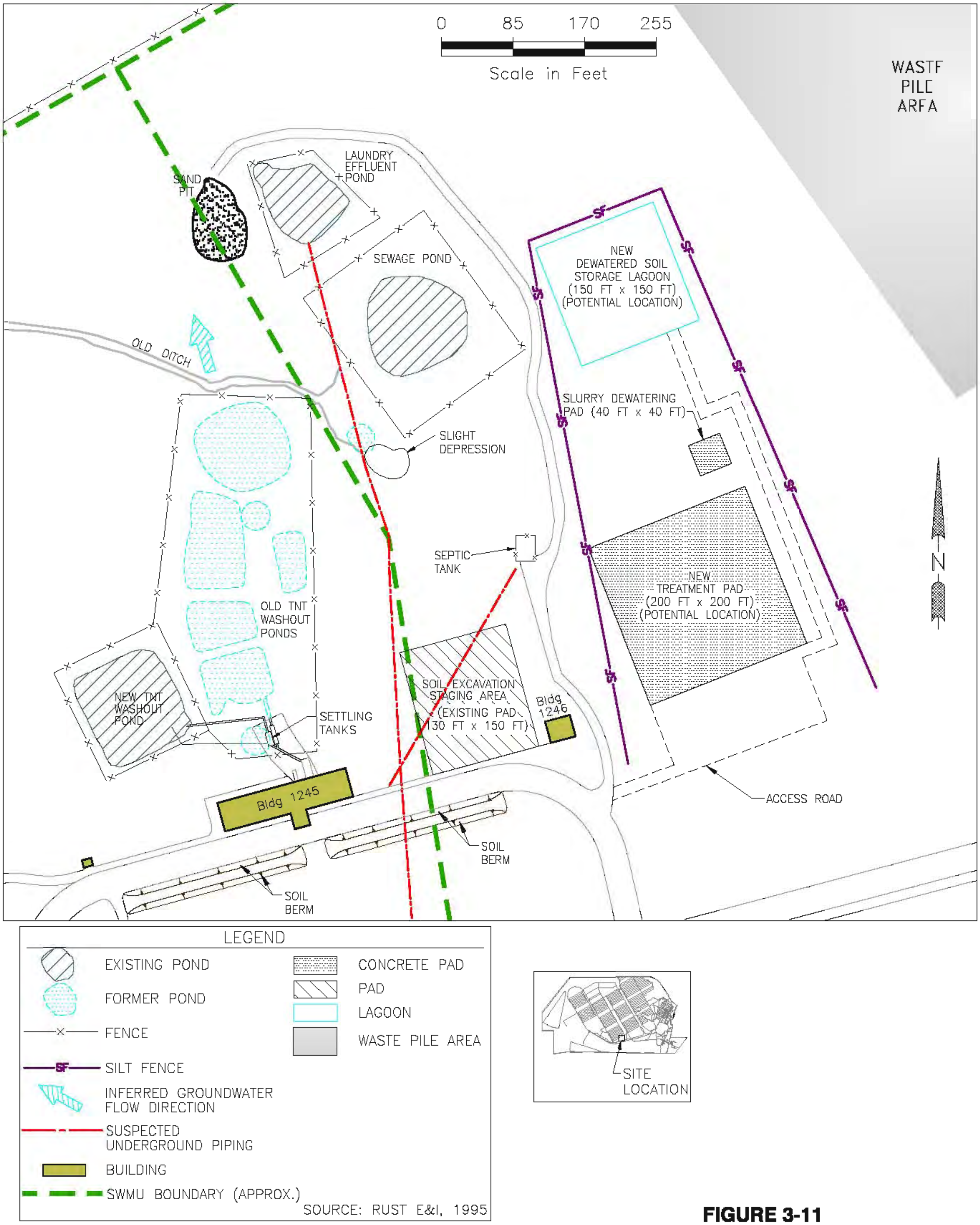

FIGURE 3-11
FULL-SCALE SLURRY PHASE BIOLOGICAL TREATMENT LAYOUT
TNT WASHOUT FACILITY (SWMU 10)
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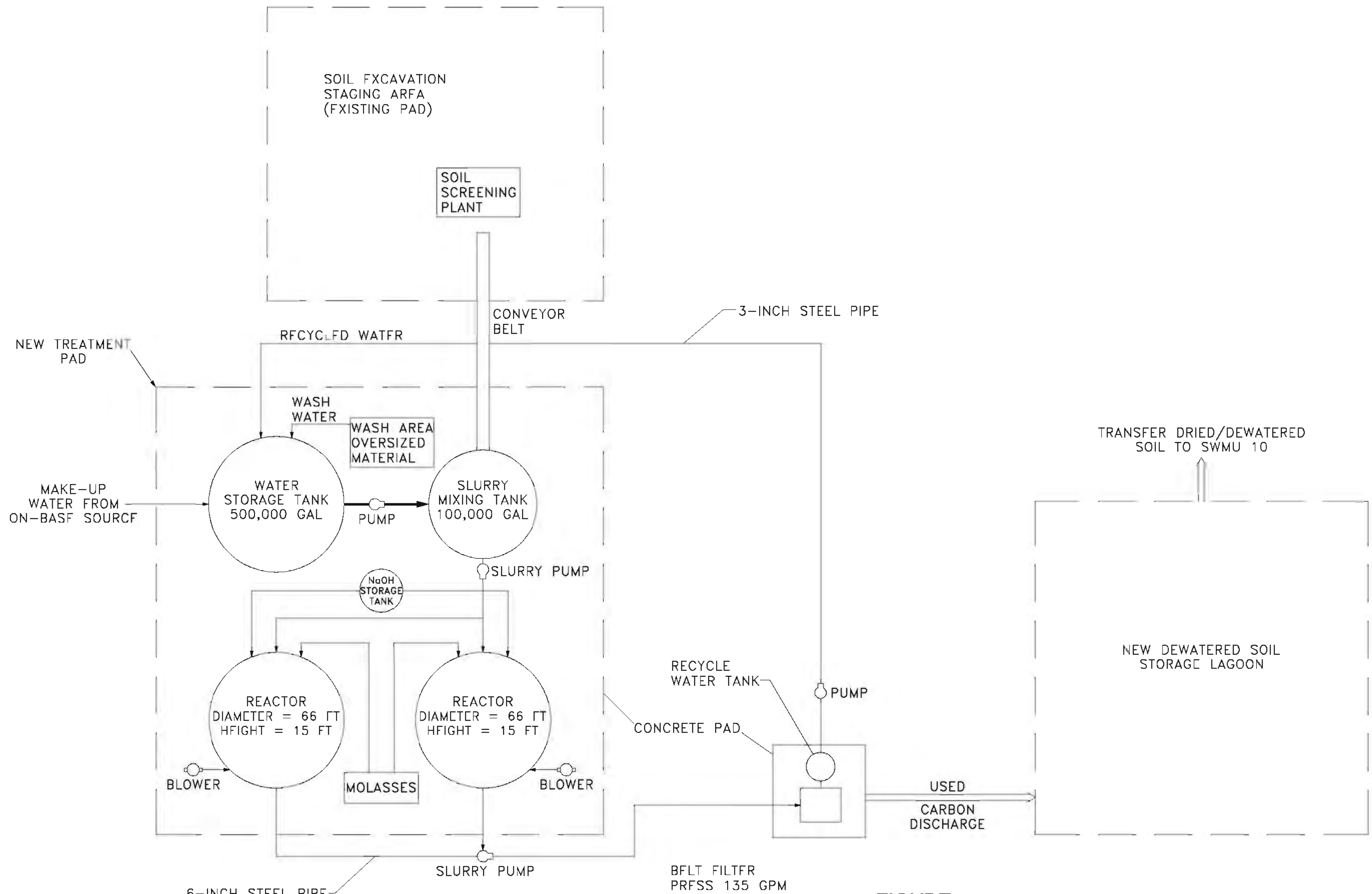

FIGURE 3-12
SLURRY PHASE BIOLOGICAL TREATMENT PROCESS
FLOW CHART
TNT WASHOUT FACILITY (SWMU 10)
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of possible TNT degradation pathways have shown that under aerobic conditions, secondary amino groups can react with oxygen to form reactive and toxic hydroxylamines – which can then combine with other hydroxylamines, humic materials, and soil organic matter to form polymers that bind tightly to soil constituents (Simplot, 1997). These hydroxylamines may then be released to the environment under certain soil conditions. The studies indicate that anaerobic bioslurry operation prevents the formation of such toxic intermediates. Metabolic fate studies of TNT biodegradation conducted during field demonstrations of the aerobic/anoxic process at Joliet Army Ammunition Plant (JAAP), Illinois, and studies of both the aerobic/anoxic and anaerobic processes at Iowa Army Ammunition Plant (IAAP) indicate that such toxic intermediates are not actually formed in the field during either process (Hampton, 1998; Argonne, 1996).

The field demonstration at IAAP further determined that both the Argonne and SABRE processes have similar biodegradation rates, treatment times, and byproducts. Both methods require:

- A cosubstrate and the maintenance of temperatures above 25°C to prevent a slowdown of microbial metabolism.

- Treatability testing to obtain optimum site-specific design criteria.

Based on the similarity of field demonstration results, both processes are considered sufficiently similar to allow the single evaluation below.

Alternative 3 also includes groundwater monitoring and land use restrictions, as discussed in Section 3.2.1.

Appendix A outlines the design and cost assumptions for this alternative.

Alternative 3 – excavation, slurry-phase biological treatment, groundwater monitoring, and land use restrictions – is evaluated as follows:

- Technical criteria

  – Performance – The slurry-phase biological treatment of soil reduces explosives concentrations to below quantitative CAOs in a reasonable amount of time, thus meeting the requirements of UAC R315-101. Together, soil treatment and land use restrictions meet qualitative CAOs (and UAC R315-101) by limiting continued effects on groundwater beyond existing contaminant levels and by protecting human health and the environment.

    The SESOIL model was performed to estimate whether cleaning soil to Depot Worker CAOs will prevent an increase in existing levels of groundwater contamination (Appendix D). The model predicts that TNT and RDX leachate from the remediated soil will not increase existing levels of groundwater contamination over the course of the model (200 years).

Field demonstrations have shown that soil loadings as high as 40 percent by weight can be effectively treated by this method in 30 to 60 days per batch (Hampton, 1998; Simplot, 1997). Treatability studies and field demonstrations have shown that intermediate breakdown products such as amino-dinitrotoluenes and diamino-nitrotoluenes are reduced to concentrations near or below the detection limit in a reasonable amount of time (Simplot, 1998, Hampton, 1998). Approximately 1.5 years is required to treat the 5,000 yd^3 of explosives-contaminated soil. Slurry treatment cannot be performed during winter months. Bench- and pilot-scale treatability studies are needed to determine site-specific rates of biodegradation and to optimize process variables. The dewatering method and disposition of the treated slurry has a significant impact on remediation feasibility and costs. The Argonne field demonstration found that dewatering of treated slurry material was hampered by the small particle sizes of the slurry.

Groundwater modeling conducted for the RDX plume (as described in Volume III of the Draft Known Releases CMS Report) shows that the RDX plume is nearing steady state and is not predicted to migrate very far beyond its current location which is several miles from the installation boundary. Natural attenuation processes, such as dilution and dispersion, are likely to reduce RDX concentrations in groundwater. RDX groundwater concentrations have decreased steadily from 1997 to 2001.

Alternative 3 reduces the toxicity and mobility of explosives detected in soil at SWMU 10. It meets the identified goals with no decrease in effectiveness over time.

– <u>Reliability</u> – Pilot-scale studies and field demonstrations at several Army sites have shown that slurry-phase biological treatment is a reliable method to permanently reduce explosives contamination in soil in a reasonable amount of time (e.g., 30 to 60 days per batch). However, this process can be conducted only during the warmest 9 months of the year. Treating the soil in a liquid phase process presents the potential of liquid-phase explosives contamination infiltrating deep into the subsurface if a spill or leak were to occur at the treatment system. At the end of full-scale slurry treatment, waste materials management consists of soils dewatering, followed by the transport of a large volume of nonhazardous water to a Subtitle C surface impoundment and the land deposition of treated soil in accordance with applicable regulations.

Alternative 3 permanently destroys explosives contaminants through mineralization and biotransformation. Because the extent of soil excavation is based on military use CAOs, land use restrictions to prevent residential development will be necessary. Land use restrictions are effective over the long term and have been implemented at many sites with positive results.

Groundwater modeling has predicted that the RDX plume will not migrate very far beyond its current location and processes such as dilution and dispersion are likely to reduce contaminant concentrations in groundwater.

Long-term environmental monitoring is required for groundwater to document that the plume migration meets the outcome predicted by modeling. A contingency plans will be enacted if this is not the case.

– <u>Implementability</u> – Slurry-phase biological treatment system components are readily available in the wastewater chemical process and hazardous waste treatment industries. Existing wells are available for groundwater monitoring. Because the specified future land use for SWMU 10 is military, continuing land use restrictions at this site should not be difficult.

– <u>Safety</u> – Because the activities associated with slurry-phase biological treatment are conducted on post, this alternative poses no health risks to off-post residential communities. Workers involved in the implementation of Alternative 3 may be exposed to explosives-contaminated soil and groundwater. The use of proper PPE, as well as other protective measures such as dust suppression and monitoring, minimizes health risks to workers. Explosives material at concentrations exceeding 10 percent (i.e., reactive material) is not expected to be present in excavated soil. Engineering controls are used to minimize the physical hazards of working around moving equipment (e.g., mixers). No significant chemical or physical hazards are expected for workers involved in groundwater monitoring.

- <u>Human health assessment</u> – Excavation and treatment of explosives-contaminated soil protect human health by reducing long-term exposure. Because this alternative includes slurry-phase biological treatment of contaminated soil, it reduces the long-term risk of exposing military personnel to explosives. The removal and treatment of contaminated soil eliminate the major source of explosives contamination at the site. The groundwater is not a source of drinking water and groundwater monitoring will document any plume migration. A contingency plan will be enacted if the plume migrates toward the base boundary or off-post receptors (which is not expected). A residual risk remaining onsite from soil contamination at concentrations below military use CAOs but above residential use CAOs. Restricting future development of the site also protects human health by preventing residential exposure to soil and groundwater contaminants.

- Environmental assessment – The excavation and treatment of explosives-contaminated soil reduces the risk to ecological receptors by limiting exposure to contaminated soil at the site. Moreover, the ecological risk derives from RDX in vegetative matter within the SWMU boundary. Therefore, all vegetation removed from grubbing of the site will be disposed of properly offsite. See Appendix C.

- Administrative feasibility – This alternative complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101, by limiting residential exposure to explosives-contaminated soil and groundwater. Contaminated soil is excavated in accordance with the requirements of UAC R307-12, Fugitive Emissions and Fugitive Dust. Slurry treatment is conducted in accordance with regulations governing solid and special waste identification, handling, treatment, storage, and disposal, as contained in Utah Solid and Hazardous Waste Regulations. If excavated soil is characterized as hazardous – which is not likely based on experience at SWMU 10 – it is handled in accordance with applicable Federal and State regulations. Groundwater is monitored in accordance with Utah groundwater quality protection regulations.

- Cost – The estimated present worth cost of implementing this corrective measures alternative using the Argonne process is $4,260,000. The estimated present worth cost is $4,240,000 if the SABRE process is used. Tables A-3 and A-4 (Appendix A) present the detailed cost estimates.

3.2.4 Alternative 4 – Excavation, Off-Post Treatment/Disposal, Groundwater Monitoring, and Land Use Restrictions

This alternative includes the excavation of approximately 5,000 yd^3 of contaminated soil using an excavator, backhoe, or similar equipment. Vegetation from within the contaminated area is also removed. Prior to excavation, large debris such as broken pipe is removed by hand. The existing PVC liner is removed wherever excavation occurs. No soil screening is necessary. It is assumed that approximately 250 yd^3 of soil is excavated per day. Confirmatory soil samples are collected from the floor and sidewalls of each excavation. Excavation and confirmatory sampling continue until the quantitative CAOs for RDX and TNT and achieved.

The excavated soil undergoes a soil profile analysis to determine if the soil exhibits a listed or characteristic RCRA hazardous waste. A preliminary review of the site contaminants and potential waste processes contributing to the contamination at SWMU 10 suggest that the explosives in soil are not listed wastes. The contaminant data suggests that some of the soil may exhibit a RCRA characteristic waste due to 2,4-

dinitrotoluene (2,4-DNT). A final waste determination will be made during the corrective action phase. A review of other regulations (e.g., State of Utah, DOT) and additional testing (e.g., TCLP) will be necessary to make this determination.

If the soil is classified as containing a hazardous waste in accordance with RCRA or other applicable criteria, it is transported to an off-post Subtitle C hazardous waste landfill for direct disposal (if concentrations meet LDR guidelines) or to a TSDF for incineration. For purposes of this CMS, it is assumed that the contaminated soil is sent to a TSDF for incineration. However, if the soil profile results are acceptable and it is determined that the soil is not a K-listed waste, the soil could be sent to an off-post Subtitle D landfill for disposal. The excavated soil is transported and manifested in compliance with applicable regulations.

Excavated areas are backfilled with clean fill obtained from an on-post borrow location. The backfilled soil surface is designed to prevent surface water ponding, to minimize erosion, and to accommodate slope stability concerns. The surface will be allowed to vegetate naturally.

Alternative 4 also includes groundwater monitoring and land use restrictions, as described in Section 3.2.1.

Appendix A outlines the design and cost assumptions for this alternative.

Alternative 4 – excavation, off-post treatment/disposal, groundwater monitoring, and land use restrictions – is evaluated as follows:

- <u>Technical criteria</u>

  - <u>Performance</u> – The removal and incineration of explosives-contaminated soil achieves quantitative CAOs in approximately 40 days, thus meeting the requirements of UAC R315-101. Together, soil treatment/disposal and land use restrictions meet qualitative CAOs (and UAC R315-101) by limiting continued effects on groundwater beyond existing contaminant levels and by protecting human health and the environment.

    The SESOIL model was performed to estimate whether cleaning soil to Depot Worker CAOs will prevent an increase in existing levels of groundwater contamination (Appendix D). The model predicts that TNT and RDX leachate from the remediated soil will not increase existing levels of groundwater contamination over the course of the model (200 years).

    Groundwater modeling conducted at SWMUs 10 and 11 (Dames & Moore, 2000) shows that the RDX plume is nearing steady state and is not predicted to migrate very far beyond its current location which is several miles from the installation boundary. Natural attenuation processes such as dilution and dispersion are likely to reduce RDX concentrations in groundwater. RDX groundwater concentrations have decreased steadily from 1997 to 2001.

This alternative reduces the toxicity and mobility of explosives detected in soil at SWMU 10. It meets the identified goals with no decrease in effectiveness over time.

– Reliability – Incineration technology is proven as an effective method for treating explosives contaminants in soil. The treated soil will meet residential cleanup levels and can be placed at SWMU 10 or in clean areas if desired. Because the extent of soil excavation is based on military use CAOs, land use restrictions to prevent residential development will be necessary. Land use restrictions are effective over the long term and have been implemented at many sites with positive results.

  Groundwater modeling has predicted that the RDX plume will not migrate very far beyond its current location and processes such as dilution and dispersion are likely to reduce contaminant concentrations in groundwater.

  Long-term environmental monitoring is required for groundwater to document that the plume migration meets the outcome predicted by modeling. A contingency plan will be enacted if this is not the case.

– Implementability – A licensed incinerator for the destruction of explosives-contaminated soil is located within 80 miles of TEAD. A RCRA Subtitle C landfill for the receipt of ash residue is located within 100 miles of TEAD. All necessary equipment, facilities, and personnel are readily available for implementation of this alternative, and experienced vendors are available to perform the work. Existing wells are available for groundwater monitoring. Because the specified future land use for SWMU 10 is military, continuing land use restrictions for this site should not be difficult.

– Safety – It is assumed that no explosive levels of 2,4,6-TNT (i.e., concentrations exceeding 10 percent) are encountered during the excavation and removal of explosives-contaminated soil from SWMU 10. The transportation of contaminated soil to the off-post incineration facility presents a minor risk to off-post residential communities. However, the contaminants are nonvolatile and immobile, and are not considered to pose a significant risk even in the event of a truck accident or spill during transportation. Compliance with all applicable requirements for the transportation of hazardous materials minimizes this potential risk. Workers involved in the implementation of Alternative 4 may be exposed to explosives-contaminated soil and groundwater. The use of proper PPE, as well as other protective measures such as dust suppression and monitoring, minimizes health risks to workers during excavation. No significant chemical or physical hazards are expected for workers involved in groundwater monitoring.

- Human health assessment – Excavation and incineration of explosives-contaminated soil protect human health by reducing long-term exposure. Because this alternative includes incineration of explosives-contaminated soil, it eliminates the long-term risk of exposing military personnel to explosives. The excavation and incineration of contaminated soil remove the major source of explosives contamination at the site. Some degree of long-term liability is associated with the placement of ash residue in a landfill. The groundwater is not a source of drinking water and groundwater monitoring will document the plume migration. A contingency plan will be enacted if the plume migrates toward the base boundary or off-post receptors (which is not expected). The residual risk remaining onsite for soil results from soil contamination at concentrations below military use CAOs but above residential use CAOs. Restricting future development of the site also protects human health by preventing residential exposure to soil and groundwater contaminants.

- Environmental assessment – The incineration of explosives-contaminated soil immediately and permanently protects ecological receptors by removing and destroying the explosives contaminants. Moreover, off-post treatment/ disposal of RDX contaminated vegetation removes the source of calculated ecological risks. See Appendix C.

- Administrative feasibility – Alternative 4 complies with applicable Federal and State laws and regulations, including the requirements of UAC R315-101, by limiting residential exposure to explosives-contaminated soil and groundwater. The excavation and confirmatory sampling of soil are implemented as described for Alternative 1 (Section 3.2.1). Contaminated soil is excavated in accordance with the requirements of UAC R307-12, Fugitive Emissions and Fugitive Dust. Decontamination water is transported off post for treatment/disposal in accordance with applicable Utah regulations.

  Alternative 4 is conducted in accordance with regulations governing waste identification, handling, treatment, storage, and disposal, as contained in Utah Solid and Hazardous Waste Regulations. If excavated soil is characterized as hazardous – which is not likely based on experience at SWMU 10 – it is handled in accordance with applicable Federal and State regulations. This alternative meets State requirements for air emissions, and groundwater is monitored in accordance with Utah groundwater quality protection regulations.

- Cost – The estimated present worth cost of implementing this corrective measures alternative is $4,170,000. Table A-5 (Appendix A) presents the detailed cost estimate.

3.2.5 Alternative 5 – Multilayer Cap, Groundwater Monitoring, and Land Use Restrictions

This alternative includes installation of a multi-layer cap over the contaminated soil. The area of soil contamination above military use CAOs is approximately 25,300 ft^2 (see Figure 3-4). Before construction of the cap, soil samples are collected and analyzed for RDX and TNT to confirm the area of contaminated soil. The proposed cap will cover all of the contaminated soil at SWMU 10 except for the hot spot in the former fifth pond. To be conservative, allowing for a even slope to the existing ground surface, and accounting for the irregular shape of the contaminated area, the cap is assumed to cover 70,000 ft^2 (see Figure 3-13). The conceptual cover system presented in this alternative will significantly reduce the amount of infiltration reaching the contaminated soil. The final cap design may differ from this conceptual cover system and will be based on an acceptable prevention of direct contact exposure and reduction of infiltration through the cap as agreed to by the Army and regulators.

The estimated area of contaminated soil in the fifth pond is 2,100 ft^2. The estimated depth and volume of contaminated soil is 2 feet and 155 yd^3. This soil is excavated and placed in the area of the cap. Both surface and subsurface confirmation samples are collected for this area and analyzed for RDX and TNT. Excavation and confirmation sampling continue until the quantitative CAOs for RDX and TNT are achieved at the fifth pond. The excavated area is then backfilled with clean soil from an on-post borrow pit. The backfilled area is then graded and covered with vegetation to prevent surface water ponding and to minimize erosion.

Preparation activities before placement of the cap include clearing of vegetation and stabilizing any extensive soft areas. The vegetation has potential contamination and is removed and transported for off-post treatment/disposal.

Figure 3-14 depicts the conceptual cover system under this alternative. From top to bottom, the final cover consists of:

- A 6-inch protective vegetative top soil layer designed to minimize cap erosion and to promote drainage off the cap. The surface shall have slopes of at least 3 percent but not more than 5 percent over the capped area;

- A 24-inch protective soil layer consisting of soil borrowed from off-site. This layer is designed to minimize erosion, mitigate root penetration and freeze/thaw problems, and store infiltrated water for later evaporation;

- A geosynthetic drainage layer to minimize water infiltration into the low permeability layer – composed of geotextile-wrapped geonet with a nominal

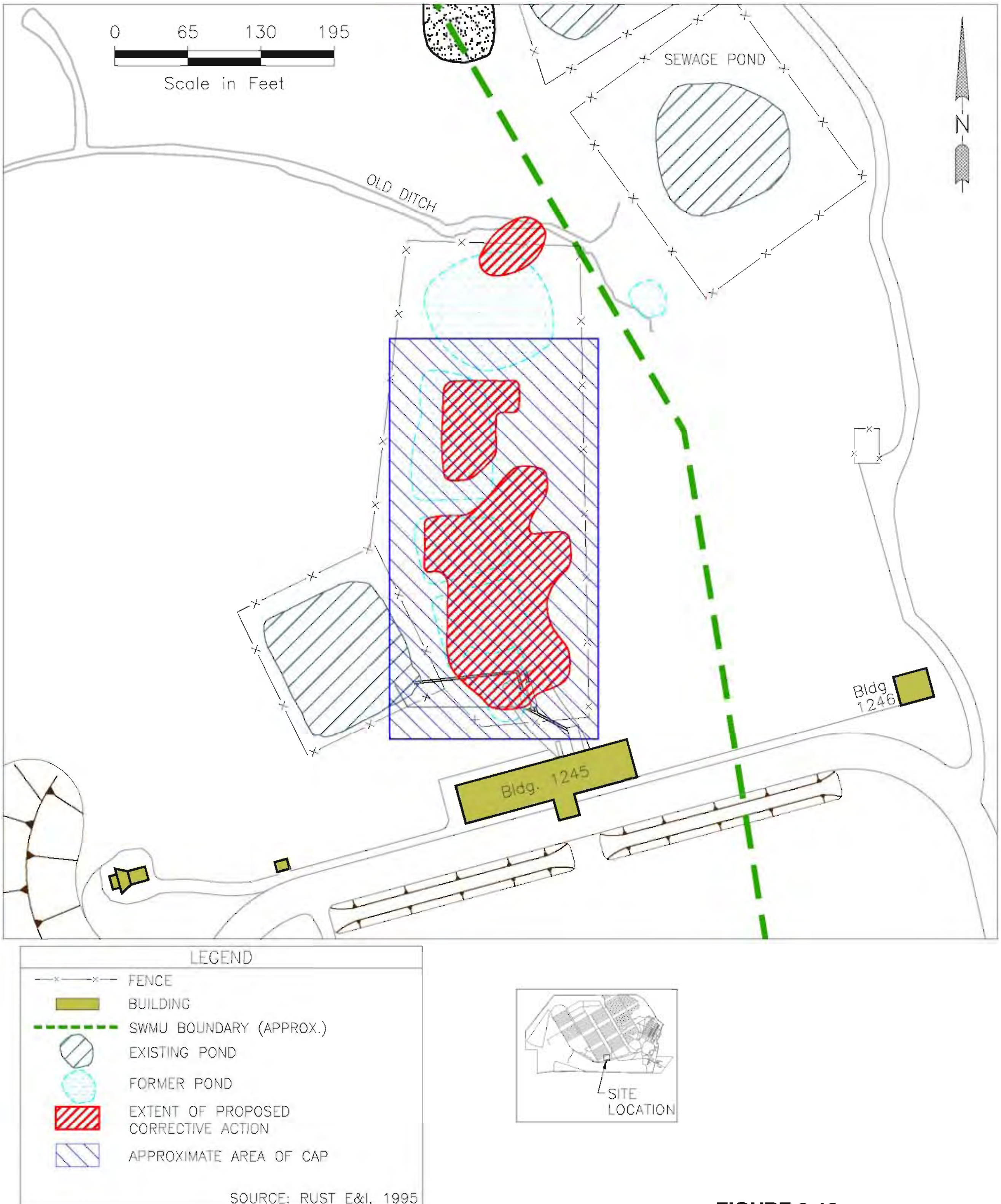

FIGURE 3-13
APPROXIMATE AREA OF
MULTI LAYER CAP
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

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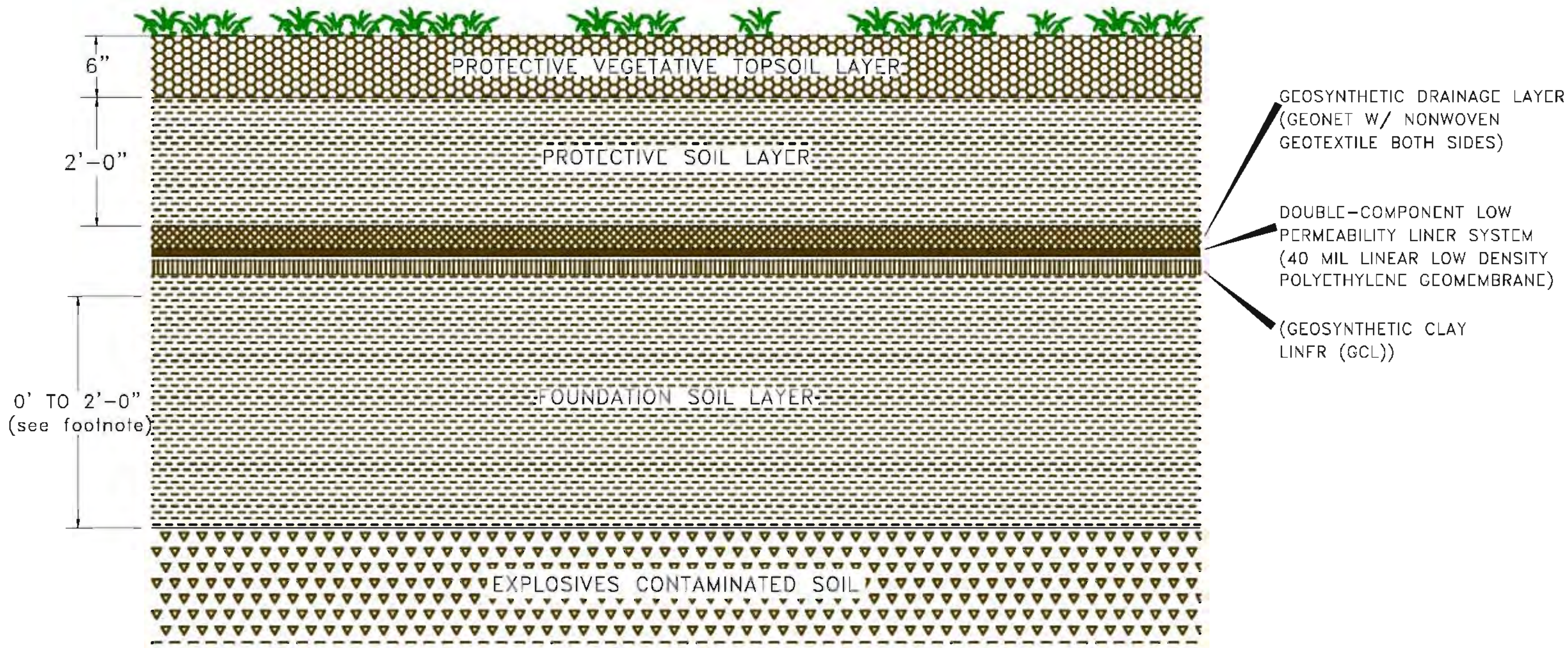

NOT TO SCALE

The foundation soil layer will increase in thickness from 0 to 3 inches at the cap edge to the approximately two feet at the cap centerline to provide the neccessary slope.

FIGURE 3-14
MULTI-LAYER CAP
CROSS SECTION (CONCEPTUAL)
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

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thickness of approximately one-quarter inch, and an in-plane hydraulic transmissivity greater than 3×10^{-5} square meters per second (m^2/sec), and a final slope of at least 2 percent after settlement. This drainage layer will drain into a perimeter water collection pipe. The perimeter pipe will release water to a basin downgradient of the cap.

- A double-component (barrier) low permeability liner system located below the frost zone – to provide long-term minimization of water infiltration into the underlying waste – consisting of a 40 mil thick geomembrane (GM) placed over a geosynthetic clay layer (GCL). A GCL is a factory-manufactured hydraulic barrier typically consisting of bentonite clay or other low permeability material, supported by geotextiles and/or geomembranes which are held together by needling, stitching, or chemical adhesives. For the purpose of this evaluation, the GCL will consist of approximately 1 pound per square foot (lb/ft^2) of adhesive-bonded granular sodium bentonite sandwiched between an upper primary woven geotextile and a lower secondary open weave geotextile;

- A foundation soil layer that is the structural base for the final cover. It includes the soils that cover the buried waste and any additional soil required to prepare the site for construction of the final cover (i.e., provide required slope of cap surface).

The cap is designed to prevent the formation of channels of water under the edges of the cap. Drainage ditches and swales are installed around the cap as needed to collect surface water runoff. The drainage ditches will drain to a basin downgradient of the cap. A fence is installed to protect the cap. The cap will be inspected at regular intervals to check for signs of erosion, settlement, or invasion by deep-rooted vegetation and burrowing animals. Regrading, revegetation, or other repairs will be implemented as needed. All of these maintenance activities will require a long-term commitment by the Army to provide the required upkeep for the cap.

Alternative 5 also includes groundwater monitoring and land use restrictions, as described in Section 3.2.1. Because a cap does not permanently remove the soil source, groundwater monitoring is assumed to continue over the 30 year period of cost estimating.

Appendix A outlines the design and cost assumptions for this alternative.

Alternative 5 – multilayer cap, groundwater monitoring, and land use restrictions – is evaluated as follows:

- Technical criteria

  – Performance – The application of land use restrictions and installation of a multi-layer cap comply with UAC R315-101-3, the "Principle of Non-

Degradation," by minimizing the infiltration of explosives from soil to groundwater or to other environmental media. Although the soil containing explosives concentrations above quantitative CAOs is left in place, Alternative 5 prevents human and ecological exposure to the contaminated soil. This alternative is applicable to both site and contaminant characteristics; as long as the soil cover is properly maintained, it meets the identified CAOs with no decrease in effectiveness over time. Together, soil capping and land use restrictions meet qualitative CAOs (and UAC R315-101) by limiting continued effects on groundwater beyond existing contaminant levels and by protecting human health and the environment.

Groundwater modeling conducted at SWMUs 10 and 11 (Dames & Moore, 2000) shows that the RDX plume is nearing steady state and is not predicted to migrate very far beyond its current location, which is several miles from the installation boundary. Natural attenuation processes such as dilution and dispersion are likely to reduce RDX concentrations in groundwater. RDX groundwater concentrations have decreased steadily from 1997 to 2001.

– Reliability – Maintenance and annual inspection of the multi-layer cap are required to ensure the long-term effectiveness of this alternative. No Depot worker exposure to the identified contamination will occur while the cap is in place. Alternative 5 does not require the management of waste materials except for vegetation stripped during site clearing activities. However, because elevated levels of explosives are left on-site, this alternative does not permanently remove the site risk. Because the extent of the cap is based on military use CAOs, land use restrictions to prevent residential development will be necessary for the cap and surrounding area. Land use restrictions are effective over the long term and have been implemented at many sites with positive results.

Providing and maintaining a vegetative cover on the cap may be difficult. Conditions at TEAD are not favorable for new plant growth. Native plants may yield better results, but plants with extensive root systems could damage the GCL.

The physical properties of GCLs are subject to extensive quality assurance/quality control at the manufacturing location, which results in a uniform and highly dependable material. GCLs are typically easy to install. However the arid climate at TEAD could potentially affect the long-term performance of the GCL. The soil above the GCL must be properly maintained so deep cracks in the soil do not exposed the GCL. Moreover, the permeability of GCLs can be increased by out-of-plane deformations caused by moderate differential settlement in the cover. Nevertheless, GCLs have been used in many cover systems with positive results and the long-term reliability of the GCL is not likely to decrease with time.

Groundwater modeling has predicted that the RDX plume will not migrate very far beyond its current location and processes such as dilution and dispersion are likely to reduce contaminant concentrations in groundwater.

Long-term environmental monitoring is required for groundwater to document that the plume migration meets the outcome predicted by modeling. A contingency plan will be enacted if this is not the case.

– Implementability – Equipment and materials required for installing the multi-layer cap are readily available. Approximately 2 to 3 months is required to complete site construction activities and to achieve the qualitative CAOs. However, maintaining a vegetative cover and preventing/repairing cracks and rips in the cover soil and GCL may be difficult. Existing wells are available for groundwater monitoring. Because the specified future land use for SWMU 10 is military, continuing land use restrictions for this site should not be difficult.

– Safety – It is assumed that no explosive levels of 2,4,6-TNT (i.e., concentrations exceeding 10 percent) are encountered during the site work to construct the multi-layer cap at SWMU 10. The transportation of contaminated vegetation to the off-post incineration facility presents a minor risk to off-post residential communities. However, the contaminants are nonvolatile and immobile, and are not considered to pose a significant risk even in the event of a truck accident or spill during transportation. Workers involved in the implementation of Alternative 5 may be exposed to explosives-contaminated soil and groundwater. The use of proper PPE, as well as other protective measures such as dust suppression and monitoring, minimizes health risks to workers during excavation. No significant chemical or physical hazards are expected for workers involved in groundwater monitoring. The physical hazards associated with heavy construction and excavation activities (e.g., noise, heavy equipment traffic, and slope stability) require the use of PPE and compliance with applicable Occupational Safety and Health Administration (OSHA) regulations. Groundwater sampling also requires the proper use of PPE.

- Human health assessment – Placing a multi-layer cap over the contaminated area protects human health by preventing both short- and long-term exposure to contaminants in soil. The residual risk remaining onsite for soil results from soil contamination at concentrations below military use CAOs but above residential use CAOs. Some degree of long term liability and residual risk is associated with the contaminated soil covered but still onsite. Residual risk remaining onsite for soil also results from soil contamination at concentrations below military use CAOs but above residential use CAOs. The groundwater is not a source of drinking water and groundwater monitoring will document any plume migration. A contingency plan will be enacted if the plume approaches the base boundary or off-post receptors (which is not expected). Restricting future development of the site also protects human health by preventing residential exposure to soil and groundwater contaminants.

- Environmental assessment – The SWERA (Rust E&I, 1997) indicated that SWMU 10 presents an unacceptable risk to ecological receptors. The installation of a cover system over contaminated areas reduces this risk by preventing exposure to contaminated soil at the site. Moreover, off-post treatment/disposal of RDX contaminated vegetation removes the source of calculated ecological risks. See Appendix C.

- Administrative feasibility – This alternative complies with applicable Federal and State laws and regulations – including the requirements of UAC R315-101, by placing a cap over the contaminated soil. This alternative does not satisfy the regulatory preference for treatment as a principal element of the remedy. Land use restrictions prevent the potential for residential exposure to contaminated soil. Because SWMU 10 is to remain under U.S. Army control, land use restrictions will be administered through the installation's Real Property Planning Board.

  Alternative 5 would be conducted in accordance with regulations governing waste identification, handling, treatment, storage, and disposal, as contained in Utah Solid and Hazardous Waste Regulations. Groundwater is monitored in accordance with Utah groundwater quality protection regulations.

- Cost – The estimated present worth cost of implementing this corrective measures alternative is $2,130,000. Table A-6 (Appendix A) presents the detailed cost estimate.

3.3 COMPARATIVE ANALYSIS OF CORRECTIVE MEASURES ALTERNATIVES

Table 3-2 and the text below summarize the comparative analysis of the five corrective measures alternatives developed for the TNT Washout Facility (SWMU 10).

- Technical criteria

  – Performance – Alternative 1 (excavation, composting, groundwater monitoring, and land use restrictions), Alternative 2 (excavation, composting, groundwater treatment, and land use restrictions), and Alternative 4 (excavation, off-post treatment/disposal, groundwater

TABLE 3-2

Comparative Analysis of Corrective Measures Alternatives
TNT Washout Facility (SWMU 10) (a)

Corrective Measures Alternative	Technical Evaluation				Human Health Assessment	Environmental Assessment	Administrative Feasibility	Cost
	Performance	Reliability	Implementability	Safety				
1. Excavation, composting, groundwater monitoring, and land use restrictions	High	High	High	Moderate	High	High	High	$2,470,000
2. Excavation, composting, groundwater treatment, and land use restrictions	High	Moderate	Moderate	Moderate	High	High	High	$4,450,000
3. Excavation, slurry-phase biological treatment, groundwater monitoring, and land use restrictions	Moderate	Moderate	Moderate	Moderate	High	High	High	$4,260,000 (Argonne process) $4,240,000 (SABRE process)
4. Excavation, off-post treatment/disposal, groundwater monitoring, and land use restrictions	High	High	High	Moderate	High	High	High	$4,170,000
5. Multilayer cap, groundwater monitoring, and land use restrictions	Moderate	Moderate	Moderate	High	High	High	High	$2,130,000

(a) Rankings indicate the effectiveness of each alternative in meeting the evaluation criteria, relative to other alternatives.

monitoring, and land use restrictions) are each rated high with respect to performance. All five of the alternatives meet both the quantitative and qualitative CAOs. However, Alternative 5 (multilayer cap, groundwater monitoring, and land use restrictions) is rated moderate for performance because it is not a permanent remedy and it only meets the CAOs if the cap is properly maintained. Alternative 3 (excavation, slurry-phase biological treatment, groundwater monitoring, and land use restrictions) is rated moderate because pilot- and bench-scale treatability studies are required to determine the ability of native microorganisms to degrade contaminants and to optimize process variables.

– Reliability – Each alternative has been shown to be effective at other sites. However, Alternative 3 is rated moderate for reliability because slurry-phase biological treatment has not been proven cost effective for large amounts of explosives-contaminated soil. In addition, the complex slurry treatment system may require more maintenance than the other treatment alternatives. Alternative 2 is also rated moderate; the groundwater extraction and treatment system requires long-term O&M. Alternative 5 is rated moderate because it does not permanently remove site contamination, providing a vegetative cover over the cap may prove difficult, and it requires annual inspection and maintenance of the fence and cap. Alternatives 1 and 4 are the most reliable corrective measures for SWMU 10, and each receives a high rating.

– Implementability – Alternative 3 is rated moderate for implementability because slurry-phase biological treatment requires a more complicated engineering design and construction than the other alternatives. Alternative 2 requires the installation of wells and the GAC treatment system, and is rated moderate when compared to implementation of groundwater monitoring in Alternatives 1, 3, 4, and 5. Both Alternatives 1 and 4 are rated high because minimal engineering and design are required. Alternative 5 is rated moderate because although it consists of commonly used materials, maintaining the cap in the arid conditions at TEAD may be difficult.

  With respect to treating contaminated soil, Alternatives 1 and 2 require approximately 1.25 years to treat 5,000 yd^3 of explosives-contaminated soil, and Alternative 3 requires about 1.5 years. Alternative 5 requires approximately 2 to 3 months. Alternative 4 requires approximately 40 days for excavation and transport of soil to the off-post incinerator. Based on this evaluation, Alternatives 4 and 5 are the most attractive in terms of implementability.

– Safety – Each alternative requires appropriate PPE during O&M activities. Alternative 3 is rated moderate because it is likely to require more safety controls than the other alternatives. The slurry component requires a more complex treatment system, including construction of a reinforced concrete pad, lagoons or reactor tanks, and the screening plant and fluidizer, in addition to setup and operation of the equipment that holds the mixers. Alternatives 1 and 2 are rated moderate because they require extensive use of motorized equipment and involve the excavation and treatment of contaminated soil. Alternative 2 also involves the installation of wells and the groundwater treatment system. Alternative 4 receives a moderate rating because – though it requires minimal safety controls during onsite operations – it presents the most potential risks to the community during off-post transport of contaminated soil. Alternative 5 is rated high for safety because it requires limited excavation and handling of contaminated soil, and only limited transport of hazardous materials (i.e., vegetation); it presents no significant short-term risk to off-post residential communities or on-post workers.

- Human health assessment – All five alternatives are protective of human health and are rated high. Alternative 5 protects human health by containing the COCs at the site beneath the cap. Alternatives 1, 2, and 3 prevent both short- and long-term exposure to contaminated soil through treatment. Alternative 4 removes the contaminated soil from SWMU 10.

- Environmental assessment – The excavation and treatment of explosives-contaminated soil in the first four alternatives equally reduce potential effects on ecological receptors by removing the contaminated soil from the site. Alternative 5 contains a multilayer cap which will minimize the exposure of ecological receptors to contaminants at the site. The removal of RDX-contaminated vegetation reduces ecological risks, as well. See Appendix C. Each alternative is rated high.

- Administrative feasibility – Each alternative meets the requirements specified in UAC R315-101 and is rated high for this criterion. It should be noted that a RCRA treatment permit may be required for Alternatives 1, 2, and 3.

- Cost – The estimated present worth cost of implementing each alternative is as follows – \$2,470,000 (Alternative 1); \$4,450,000 (Alternative 2); \$4,260,000 (Alternative 3, Argonne process) and \$4,240,000 (Alternative 3, SABRE process); \$4,170,000 (Alternative 4); and \$2,130,000 (Alternative 5).

3.4 RECOMMENDED CORRECTIVE MEASURES ALTERNATIVE

Based on the comparative analysis presented in Section 3.3, Alternative 1 – excavation, composting, groundwater monitoring, and land use restrictions – is the recommended alternative for SWMU 10 because:

- It meets the quantitative and qualitative CAOs, including protection of human health and the environment, and complies with UAC R315-101-3, the "Principle of Non-Degradation."

- It has been demonstrated at other sites and has proven successful in a site-specific treatability study.

- It is reliable.

- It can be safely implemented.

- It presents no health risks to off-post residential communities.

- It does not require long term O&M.

- It is cost effective.

4.0 SUMMARY OF THE RECOMMENDED CORRECTIVE MEASURES ALTERNATIVE

Based on the evaluation of corrective measures alternatives, Section 4.0 lists the recommended alternative for SWMU 10. This recommendation is based on the evaluation criteria considered in the detailed analyses, as reported in Section 3.0. Table 4-1 summarizes the evaluations conducted for SWMU 10.

SWMU 10 – TNT WASHOUT FACILITY

Excavation, composting, groundwater monitoring, and land use restrictions is the recommended corrective measures alternative for the TNT Washout Facility (SWMU 10).

TABLE 4-1

Summary of Comparative Analysis of Corrective Measures Alternatives
TNT Washout Facility (SWMU 10)
Tooele Army Depot

SWMU	Technical Evaluation							
Corrective Measures Alternative (a)	**Performance**	**Reliability**	**Implementability**	**Safety**	**Human Health Assessment**	**Environmental Assessment**	**Administrative Feasibility**	**Cost ($)**
TNT Washout Facility (SWMU 10)								
Alternative 1: Excavating, composting, groundwater monitoring, and land use restrictions	Meets all identified CAOs; likely to achieve quantitative CAOs in 1.25 years	Proven effective at other sites; some O&M and long term groundwater monitoring required	Easily implemented under current conditions	Short-term risk to onsite workers minimized by engineering and safety controls	Protective of human health	Prevents exposure of ecological receptors to contaminated soil	Meets requirements of UAC R315-101	2,470,000
Alternative 2: Excavating, composting, groundwater treatment, and land use restrictions	Meets all identified CAOs; likely to achieve quantitative CAOs in 1.25 years	Proven effective at other sites; some O&M and long term groundwater monitoring and treatment system O&M required	More complicated engineering design required for groundwater treatment system	Short-term risk to onsite workers minimized by engineering and safety controls	Protective of human health	Prevents exposure of ecological receptors to contaminated soil	Meets requirements of UAC R315-101	4,450,000
Alternative 3: Excavating, slurry-phase biological treatment, groundwater monitoring, and land use restrictions	Meets all identified CAOs; likely to achieve quantitative CAOs in 1.5 years; treatability study required and can only be conducted during the nine warmer months of the year	Proven effective at other sites for smaller volumes of soil; long term groundwater monitoring and treatability study required	More complicated engineering design required	Short-term risk to onsite workers minimized by engineering and safety controls	Protective of human health	Prevents exposure of ecological receptors to contaminated soil	Meets requirements of UAC R315-101	4,260,000 (Argonne process) or 4,240,000 (SABRE process)
Alternative 4: Excavation, off-post treatment/ disposal, groundwater monitoring, and land use restrictions	Meets all identified CAOs; likely to achieve quantitative CAOs in 40 days	Proven effective at other sites; long term groundwater monitoring required	Easily implemented under current conditions	Short-term risk to off-post communities and onsite workers minimized by engineering and safety controls	Protective of human health	Prevents exposure of ecological receptors to contaminated soil	Meets requirements of UAC R315-101	4,170,000

SWMU	Technical Evaluation							
Corrective Measures Alternative (a)	**Performance**	**Reliability**	**Implementability**	**Safety**	**Human Health Assessment**	**Environmental Assessment**	**Administrative Feasibility**	**Cost ($)**
Alternative 5: Multilayer cap, groundwater monitoring, and land use restrictions	Meets all identified CAOs if landfill cover is properly maintained	Proven effective at other sites; long-term cover O&M and groundwater monitoring required	Maintaining cap in the arid conditions at TEAD may be difficult	Short-term risk to onsite workers minimized by engineering and safety controls	Protective of human health	Prevents exposure of ecological receptors to contaminated soil	Meets requirements of UAC R315-101	2,130,000

(a) The recommended corrective measures alternative is shown in bold italic type.

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APPENDIX A

Design and Cost Assumptions

APPENDIX A

Design and Cost Assumptions

The cost estimates made for this CMS are anticipated to provide an accuracy of +50 to -30 percent based on available data from previous documents related to the Known Releases SWMUs and engineering judgment.

A.1 COST ESTIMATES AND CONCEPTUAL DESIGN FOR SWMU 10

This appendix presents conceptual designs and assumptions employed in developing cost estimates for the corrective measures alternatives evaluated for SWMU 10 in this CMS Report. Section A.1.2 presents detailed cost estimates for the five corrective measures alternatives identified at SWMU 10.

A.1.1 DESIGN AND COST ASSUMPTIONS

A.1.1.1 Composting

- It is assumed that approximately 5,000 cubic yards of soil will need to be treated (see Figure 3-4).

- A 100 ft $\times$ 310 ft asphalt pad will be constructed for composting operations. The pad will consist of a 6-inch compacted aggregated subbase and a 3-inch asphaltic concrete layer. The existing asphalt pad at SWMU 10 will be used as a staging area for soil excavation and as amendment storage/decontamination area.

- Site grading/clearing costs include equipment and labor necessary for clearing of site vegetation as needed prior to remedial activities.

- Contaminated soil will be excavated and treated in 18 batches. A soil berm will be placed around the excavated areas to prevent run-off from entering the excavation. Shoring will be required for the excavation. Excavated areas will be backfilled with clean soil from an on-site borrow source. No liner will be needed to cover backfilled areas. Confirmatory samples will be collected from the excavated areas and analyzed on-site using field test kits. A total of 48 soil samples will be collected and analyzed for explosives at an off-site laboratory.

- Disposal of vegetation and PVC liner includes costs associated with transportation and off-post disposal at an appropriate disposal facility and other treatment methods required prior to landfilling, if applicable.

- Backfilling costs include backfilling of excavated areas with treated soil, and compaction, as necessary.

- Four windrows (10 ft wide × 265 ft long × 5 ft high) will be built. Composting will be conducted on an asphalt pad with a soil/fence wind block on the north and south ends of the pad.

- Windrows will be constructed using the following recipe:

Component	Percent by Volume	Volume (cy)*
Soil	30	5,000
Wood Chips	10	1,700
Alfalfa	15	2,550
Lettuce	10	1,700
Barley	10	1,700
Cow Manure	20	3,400
Chicken Manure	5	850
Molasses	--	5,250 gallons

* Amendment volumes are based on a total compost volume of 5,000 cy soil/0.30 = 16,670 cy compost.

- Composting will be conducted in 18 batches, each with a 25-day duration (15 days treatment, 10 days to test and dispose old compost and construct new windrows).

- Samples will be collected on Days 0 and 15 of each batch and analyzed for explosives. One composite sample will be collected per 50 cy of compost. One sample will be analyzed for TCLP (metals) per 50 cy of compost at the end of each batch. The composted soil is aged up to three months before it is placed back into the excavated area. The composted soil is aged at the asphalt pad or similar area.

- Treated compost that meets CAOs and TCLP standards will be disposed of at SWMU 10 and will be covered with a soil layer.

- Environmental engineers will also serve as site safety officers and construction supervisors.

- The cost estimate does not account for equipment salvage value.

- It is assumed that the asphalt pad will not be removed at the conclusion of remediation activities.

This cost estimate is based on calculations and information sources presented in the SWMU 10 soil composting treatability study (Dames & Moore, 1998).

A.1.1.2 Groundwater Monitoring

- Groundwater samples will be collected from 5 wells every six months under each of the alternatives.

- A total of 8 samples will be collected (5 field samples, one field duplicate, one matrix spike, and one matrix spike duplicate) and analyzed for TNT and RDX at an off-site laboratory. In addition, the pH and redox potential of groundwater and the water level in each well will also be measured.

- Well sampling costs include labor, materials, and equipment necessary for collecting groundwater samples. The cost of chemical analysis and purge water disposal are also included.

- Cost of preparing annual reports includes labor and materials necessary for data analysis, evaluation of site conditions, and recommendations for continuation of yearly reviews and monitoring.

A.1.1.3 Land Use Restrictions

- Includes legal and administrative costs associated with obtaining land use restrictions from the Army.

A.1.1.4 Groundwater Extraction and Treatment

- Groundwater will be extracted using three extraction wells. Contaminated water will be treated using activated carbon. Treated water will be reinjected into the ground water using three injection wells.

- Cost for extraction and injection well installation includes labor, materials, and equipment necessary for the installation of wells, pumps, and associated piping and electrical equipment. Costs for well development are also included.

- Cost for underground piping installation includes labor, materials, and equipment necessary for installing a 2-inch HDPE pipe at a depth of 3 ft bgs.

- Asphalt pad will consist of a 6-inch aggregate subbase and a 3-inch asphaltic concrete layer.

- Due to the unavailability of isotherm data for RDX, the daily carbon usage was estimated based on isotherm data for thymine (structurally similar to RDX).

- Cost of carbon adsorbers include freight and cost of two adsorbers and 2,000 pounds of carbon. Piping costs are also included.

- Cost of filters includes freight and cost of two iron/sediment filters.

- Effluent monitoring system will consist of a port for collecting effluent samples, and a pair of valves to direct part or all of the plant effluent back to the equalization tank.

- Cost of spent carbon disposal includes materials, labor, chemical analysis, and transportation costs for placing spent carbon in 55-gallon drums and transporting and disposing spent carbon at a hazardous waste landfill.

- Groundwater monitoring as described in A.1.1.2 is also included.

A.1.1.5 Bio-Slurry

- Approximately 5,000 cubic yards of soil will need to be treated.

- Contaminated soil will be excavated and treated in 10 batches. Excavated areas will not be backfilled until all contaminated soil has been excavated. Shoring will be required for the excavation. A soil berm will be placed around the excavated areas to prevent run-off from entering the excavated area. In addition, the excavated areas will be covered with a plastic liner. Confirmatory samples will be collected from the excavated areas and analyzed on-site using field test kits. A total of 48 soil samples will be collected and analyzed for explosives at an off-site laboratory.

- Backfilling costs include backfilling of excavated areas with treated soil, and compaction, as necessary.

- Disposal of vegetation and PVC liner includes costs associated with transportation and off-post disposal at an appropriate disposal facility and other treatment methods required prior to landfilling, if applicable.

- The existing asphalt pad at SWMU 10 will be used as a staging area for soil excavation/screening.

- Material greater than #10 mesh (2.0 mm) will be separated using a vibrating screen. The oversized material will be washed and returned to SWMU 10. Washwater from this operation will be used in the preparation of the soil slurry. However, based on a grain size analysis of soils at SWMU 10, the quantity of oversized material is expected to be minimal.

- Two concrete pads will be constructed for the treatment and dewatering of soil. The pads will consist of a 6-inch aggregate subbase and a 12-inch concrete layer.

- Site grading/clearing costs include equipment and labor necessary for clearing of site vegetation as needed prior to remedial activities.

- Remediation will be conducted in 9 batches. Duration of treatment will be four weeks per batch. Two additional weeks will be required to prepare slurry, load/unload reactors, and dewater treated slurry. Slurry will be prepared in a slurry mixing tank, and will be transferred to the reactors. Diffusers and a blower will be required for the Argonne process.

- For the Argonne process, sodium hydroxide will be used to control pH. Molasses will be used as a substrate for the bioremediation process.

- For the SABRE process, chemicals include inoculum, starch, a pH buffer, and pH adjustment.

- Treated slurry will be dewatered using a belt filter press.

- Dewatered soil will be transferred to a lagoon for further drying. All water will be recycled.

- The dewatered/dried soil will be transferred to SWMU 10 at the conclusion of remediation activities. Clean soil from an on-site source will be used to complete backfilling. Finally a 6-inch compacted layer of soil will be placed over the TNT washout pond area.

- It is assumed that the salvage value of the process equipment will cover any demobilization/equipment dismantling costs.

A.1.1.6 Off-Post Treatment/Disposal

- Approximately 5,000 cubic yards of soil will need to be excavated and disposed of.

- Contaminated soil will be excavated using an excavator, backhoe, or similar equipment. Shoring will be required for the excavation. Excavated areas will not be backfilled until all contaminated soil has been excavated. A soil berm will be placed around the excavated areas to prevent run-off from entering the excavated area. In addition, the excavated areas will be covered with a plastic liner. Confirmatory samples will be collected from the excavated areas and analyzed on-site using field test kits. A total of 48 soil samples will be collected and analyzed for explosives at an off-site laboratory.

- Backfilling costs include hauling free backfill from on-post (distance less than 6 miles) borrow source, backfilling of excavated areas, and compaction, as necessary.

- Off-Post treatment/disposal cost includes labor, materials, and equipment necessary for transporting and incinerating soil at a local off-site hazardous waste treatment facility. Results of confirmation sampling and soil profiling are used to make the final determination concerning appropriate destinations for excavated material (TSDF, Subtitle C landfill or Subtitle D landfill). The type of disposal facility which can accept the excavated material is based on a preliminary review of site contaminants and potential waste processes contributing to contamination at each SWMU. Assumed disposal costs may change significantly if the final disposal determination differs from that assumed in the CMS report.

A.1.1.7 Multi-Layer Cap

- A 6-foot-high chainlink fence (includes support posts, corner posts, and a locking gate) will be build around the cap.

- Ground preparation and clearing includes equipment and labor necessary for clearing site vegetation as needed prior to remedial activities.

- Soil excavation includes labor and equipment necessary for excavation of contaminated soil from the fifth pond to a nearby staging area for subsequent placement under the cap. In general, the shallow excavation depths at the fifth pond do not require special safety measures, such as shoring or access control.

- Confirmatory samples will be collected from cap boundary and the excavated areas. A total of 95 soil samples will be collected and analyzed for explosives at an off-site laboratory.

- Backfilling includes costs associated with hauling free backfill from on post (distance less than 6 miles), backfilling of excavated areas, and compaction, as necessary. Unit costs for backfill are increased to account for the increased costs associated with the uncompacted soil volumes.

- Disposal of vegetation includes costs associated with transportation and off-post disposal at an appropriate disposal facility and other treatment methods required prior to landfilling, if applicable.

- Surveying includes costs for a topographic survey, a control survey, and grading control during construction of the cap, and the as-built survey of the completed cap.

- Well abandonment of well N-146-97, which is located very close to the cap.

- Foundation soil layer: It is estimated that approximately 3,300 cubic yards of cut soil will be required to provide a foundation layer that meets slope requirements and provides an acceptable surface for the barrier layers. It is assumed this fill soil will be provided from an on-base borrow pit.

- Barrier layer: 40 mil HDPE geomembrane

- Barrier layer: Geosynthetic clay liner

- Soil drainage layer: Geotextile wrapped geonet with a perimeter water collection pipe.

- Protective soil layer: This layer will consist of soil at a thickness of 24 inches for the multi-layer cap. It is assumed that this fill (approximately 5,200 cubic yards) will be provided from an on-base borrow pit. This layer will cover approximately 70,000 ft^2 to provide required slopes to the existing surface beyond the cap.

- Protective vegetative cover layer: Six inches of topsoil mixed with gravel with be used for the surface layer.

- Vegetation: Seed and fertilizer shall cover the 70,000 ft^2 surface.

- Drainage ditches and swales shall surround the cap and drain to a downgradient basin.

- Annual inspection and maintenance includes labor, materials, and equipment for annual inspection/maintenance to ensure the long-term reliability of the cap and fence.

A.1.1.8 Indirect Capital Cost Assumptions

A.1.1.8.1 Engineering and Construction Management

- Cost associated with providing technical engineering support during the design and construction phases of various remedial activities are assumed to be up to 20 percent of total direct costs.

A.1.1.8.2 Health and Safety Equipment and Training

- Costs associated with providing health and safety equipment and training for use during remediation activities are assumed to be up to 5 percent of total direct costs.

A.1.1.8.3 Legal and Administrative

- Costs associated with any legal and administrative issues associated with implementation of the remedial action such as coordination with Federal, State, and local agencies; landowners; and other authorities are assumed to be up to 5 percent of total direct costs.

A.1.1.8.4 Project Management

- Costs associated with providing technical direction, quality control, monthly progress reports, and invoice generation for the project are assumed to be 5 to 10 percent of total direct costs, depending on the types of activities and technologies involved in a corrective measures alternative.

A.1.1.8.5 Other Cost Estimating Assumptions

The following are other general assumptions for development of cost estimates.

- The volume of soil after excavation (i.e., no longer compacted) is 25 percent greater than the in-place volume to be excavated.

- Each cubic yard excavated soil weighs approximately 1.5 tons (based on density of 1.66 g/cm^3).

- Each load to be transported to an offpost landfill weighs 20 tons.

- For present worth calculations, the discount rate is based on real interest rates on U.S. Treasury Notes and Bonds as presented in the U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 2002).

- The contingency cost is 20 percent of the cost of the alternative.

A.1.2 DETAILED COST ESTIMATES

Tables A-1 through A-5 provide detailed cost estimates for the various alternatives evaluated for SWMU 10.

Table A-1: SWMU 10 - Alternative 1:
Excavation, Composting, Groundwater Monitoring, and Land Use Restrictions

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Direct Capital Costs				
o Composting				
Asphalt Pad Construction				
- Mobilization	1	ea	5,000.00	5,000
- Silt Fence	800	lf	1.30	1,100
- Site Grading/Clearing	3,800	sy	5.00	19,000
- Asphalt Pad	3,445	sy	13.38	46,100
- Labor to install wind/snow fence	30	hr	25.00	800
Subtotal Asphalt Pad Construction				72,000
Access Road Construction				
- Site Grading/Clearing	500	sy	5.00	2,500
- Aggregate Layer (3-inch, compacted)	500	sy	4.00	2,000
Subtotal Access Road Construction				4,500
Soil Excavation				
- Equipment				
Backhoe	35	day	200.00	7,000
Front-end Loader	15	month	5,600.00	84,000
Soil Screening Plant	35	day	415.00	14,600
Steam Cleaner	20	day	75.00	1,500
- Labor				
Equipment Operators	350	hr	37.00	13,000
Laborer (for Equipment Decontamination)	200	hr	25.00	5,000
- Backfill Excavation	5,000	cy	2.00	10,000
- Off-post disposal of vegetation and liner	6	ton	1,200.00	7,200
- Field Test Kits (TNT and RDX)	24	ea	410.00	9,900
- Confirmatory Samples (2 per batch)	48	sample	150.00	7,200
Subtotal Soil Excavation				159,400
Windrow Maintenance				
- Windrow Turner				
Rental	15	month	5,310.00	79,700
Maintenance	15	month	957.00	14,400
Freight	1	ea	3,000.00	3,000
Operator Training	1	ea	1,000.00	1,000
- Front-end Loader (Skid Loader)	15	month	1,742.00	26,200
- Water Hose	1,000	lf	7.00	7,000
Subtotal Windrow Maintenance				131,300
Monitoring Equipment				
- Oxygen Meter	1	ea	550.00	600
- Temperature Meter	1	ea	225.00	300
- Oven	1	ea	476.00	500
- Desiccator	2	ea	42.00	100
- Balance	1	ea	445.00	500
- pH Meter	1	ea	650.00	700
- Ammonia Meter	1	ea	845.00	900
- LEL Meter	1	ea	700.00	700
- Glassware				
Beakers (Glass, 100-ml)	2	pack	29.00	100
Evaporating Dishes	20	ea	8.00	200
- Miscellaneous Supplies	15	month	200.00	3,000
Subtotal Monitoring Equipment				7,600

Table A-1: SWMU 10 - Alternative 1:
Excavation, Composting, Groundwater Monitoring, and Land Use Restrictions

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Site Restoration				
- Steam Cleaner (2 for 7 days ea)	14	day	75.00	1,100
- Labor (4 for 7 days @ 10hrs/day)	280	hr	25.00	7,000
- Decontamination Water Disposal	90	55-gal drum	132.00	11,900
- Sampling (1 per drum)				
Explosives	90	sample	150.00	13,500
TCLP metals	90	sample	144.00	13,000
Subtotal Site Restoratior				46,500
o Land Use Restriction	1	ls	5,000.00	5,000
Subtotal Direct Capital Costs				427,000
Indirect Capital Costs				
Engineering and Construction Management (20% of direct costs)				86,000
Health and Safety Equipment & Training (5% of direct costs)				21,400
Legal and Administrative (5% of direct costs)				21,400
Project Management (5% of direct costs)				21,400
Subtotal Indirect Capital Costs				150,200
Total Capital Costs				580,000
Annual O&M Costs				
o Composting				
Amendments (per cy of soil treated) (1)				
Wood Chips	4,000	cy	5.87	23,500
Alfalfa	4,000	cy	21.12	84,500
Barley	4,000	cy	27.37	109,500
Lettuce	4,000	cy	5.1	20,400
Cow Manure	4,000	cy	39.1	156,400
Chicken Manure	4,000	cy	1.57	6,300
Molasses	77	55-gal drum	201	15,500
Subtotal Amendments				416,100
Process Sampling				
- Explosives (1 sample per 50 cy soil, Day 1;	400	sample	150	60,000
1 sample per 50 cy compost, day 15; + 80 samples for contingency)				
Subtotal Process Samplinc				60,000
Labor				
- Field Manager (1 @ 40 hrs/wk, 26 wks)	1,040	hr	36	37,500
- Environmental Engineer (2 @ 40 hrs/wk, 52 wk	4,160	hr	48	199,700
- Equipment Operator (1 @ 40 hrs/wk, 52 wks)	2,080	hr	37	77,000
- Laborer (2 @ 40 hrs/wk, 52 wks)	4,160	hr	25	104,000
Subtotal Labor				418,200

Table A-1: SWMU 10 - Alternative 1:
Excavation, Composting, Groundwater Monitoring, and Land Use Restrictions

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Other Costs				
- Field Trailer	12	month	382	4,600
- Portable Toilet	12	month	93	1,200
- Utilities				
Water	12	month	147	1,800
Electricity	12	month	20	300
Subtotal Other Costs				7,900
Total Annual Composting O&M Costs				902,200
Present Worth Annual Compost O&M Costs(1.25 yrs @ 2.1%Discount Rate) (2)				1,130,000
o Groundwater Monitoring (Semi-annually)				
- Sampling-Labor	140	hr	48	6,800
- Sampling-Analytical	16	sample	170	2,800
- Water disposal, sampling equipment	2	ls	4000	8,000
- Data Analysis & Report Preparation	2	ea	8000	16,000
Total Annual Groundwater Monitoring O&M Costs				33,600
Present Worth Annual GM O&M Costs (8 years @ 3.1% Discount Rate) (2				243,000
Total Present Worth Annual O&M Costs				1,373,000
Subtotal Cost of Alternative				1,953,000
Inflation adjustment (costs based on 1998 dollars,6 % adjusment to 2002 dollars)				117,180
Contingency (@ 20%)				390,600
Total Cost of Alternative				2,470,000

Key to unit abbreviations

cy	cubic yard
day	per day
ea	each
hr	hour
lf	linear foot
ls	lump sum
month	per month
pack	per pack
sample	per sample
sy	square yard
wk	per week
55-gallon drum	per 55-gallon drum

(1) Unit cost for each amendment is per cy of soil treated. Cost for each amendment increased by 15 % to account for spillage.
(2) Discount Rates based on U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 20(

Table A-2: SWMU 10 - Alternative 2: ***Excavation, Composting, Ground Water Treatment, and Land Use Restrictions***

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Direct Capital Costs				
o Composting				
Asphalt Pad Construction				
- Mobilization	1	ea	5,000.00	5,000
- Silt Fence	800	lf	1.30	1,100
- Site Grading/Clearing	3,800	sy	5.00	19,000
- Asphalt Pad	3,445	sy	13.38	46,100
- Labor to install wind/snow fence	30	hr	25.00	800
Subtotal Asphalt Pad Construction				72,000
Access Road Construction				
- Site Grading/Clearing	500	sy	5.00	2,500
- Aggregate Layer (3-inch, compacted)	500	sy	4.00	2,000
Subtotal Access Road Construction				4,500
Soil Excavation				
- Equipment				
Backhoe	35	day	200.00	7,000
Soil Screening Plant	35	day	415.00	14,600
Steam Cleaner	20	day	75.00	1,500
Front-end Loader	15	month	5,600.00	84,000
- Labor				
Equipment Operators	350	hr	37.00	13,000
Laborer (for Equipment Decontamination)	200	hr	25.00	5,000
- Backfill Excavation	5,000	cy	2.00	10,000
- Off-post disposal of vegetation and liner	6	ton	1,200.00	7,200
- Field Test Kits (TNT and RDX)	24	ea	410.00	9,900
- Confirmatory Samples (2 per batch)	48	sample	150.00	7,200
Subtotal Soil Excavation				159,400
Windrow Maintenance				
- Windrow Turner				
Rental	15	month	5,310.00	79,700
Maintenance	15	month	957.00	14,400
Freight	1	ea	3,000.00	3,000
Operator Training	1	ea	1,000.00	1,000
- Front-end Loader (Skid Loader)	15	month	1,742.00	26,200
- Water Hose	1,000	lf	7.00	7,000
Subtotal Windrow Maintenance				131,300
Monitoring Equipment				
- Oxygen Meter	1	ea	550.00	600
- Temperature Meter	1	ea	225.00	300
- Oven	1	ea	476.00	500
- Desiccator	2	ea	42.00	100
- Balance	1	ea	445.00	500
- pH Meter	1	ea	650.00	700
- Ammonia Meter	1	ea	845.00	900
- LEL Meter	1	ea	700.00	700
- Glassware				
Beakers (Glass, 100-ml)	2	pack	29.00	100
Evaporating Dishes	20	ea	8.00	200
- Miscellaneous Supplies	15	month	200.00	3,000
Subtotal Monitoring Equipment				7,600

Table A-2: SWMU 10 - Alternative 2: ***Excavation, Composting, Ground Water Treatment, and Land Use Restrictions***

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Site Restoration				
- Steam Cleaner (2 for 10 days ea)	14	day	75.00	1,100
- Labor (4 for 10 days @ 10hrs/day)	280	hr	25.00	7,000
- Decontamination Water Disposal	90	55-gal drum	132.00	11,900
- Sampling (1 per drum)				
Explosives	90	sample	150.00	13,500
TCLP metals	90	sample	144.00	13,000
Subtotal Site Restoration				46,500
Subtotal Composting				421,300
o Groundwater Extraction and Treatment				
Extraction System				
- Treatibility Study, Aquifer Tests	1	ls	60,000.00	60,000
- Mobilization	1	ls	5,000.00	5,000
- Layout Survey	2	day	1,360.00	2,800
- Extraction Wells: 6-inch dia. Sch. 80 PVC	1,050	lf	130.00	136,500
- Injection Wells: 5-inch dia. Sch. 80 PVC	450	lf	105.00	47,300
- Submersible pump	3	ea	2,700.00	8,100
- Riser discharge pipe	1,050	lf	7.00	7,400
- Baker pitless adapter	3	ea	1,900.00	5,700
- Electrical wiring	1,000	lf	3.00	3,000
- Underground Piping Installation	10,450	lf	10.00	104,500
Subtotal Extraction System				380,300
Treatment System				
- Treatment Building (pad included)	1	ea	64,000.00	64,000
- Equalization Tank	1	ea	15,000.00	15,000
- Transfer Pump	1	ea	6,050.00	6,100
- Filter (Carbtrol PFB-50)	2	ea	860.00	1,800
- Carbon Adsorbers (Carbtrol HP-1700)	2	ea	12,910.00	25,900
- Instrumentation and controls	1	ea	50,000.00	50,000
- Programmable Logic Controller	1	ea	35,000.00	35,000
- Effluent Monitoring System	1	ea	5,500.00	5,500
- Misc. Process Equipment & Installation	1	ls	20,000.00	20,000
Subtotal Treatment System				223,300
Site Work				
- Landscaping and grading	1	ea	10,000.00	10,000
Subtotal Sitework				10,000
Subtotal Groundwater Extraction and Treatment				613,600
o Land Use Restriction	1	ls	5,000.00	5,000
Subtotal Direct Capital Costs				1,039,900

Table A-2: SWMU 10 - Alternative 2: *Excavation, Composting, Ground Water Treatment, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Indirect Capital Costs				
Engineering and Construction Management (20%)				207,000
Health and Safety Equipment & Training (5% of direct costs)				52,000
Legal and Administrative (5% of direct costs)				52,000
Project Management (5% of direct costs)				52,000
System Startup (2% of ground water treatment direct costs)				12,272
Subtotal Indirect Capital Costs				375,300
Total Capital Costs				1,420,000
Annual O&M Costs				
o Composting				
Amendments (per cy of soil treated) (1)				
Wood Chips	4,000	cy	5.87	23,500
Alfalfa	4,000	cy	21.12	84,500
Barley	4,000	cy	27.37	109,500
Lettuce	4,000	cy	5.1	20,400
Cow Manure	4,000	cy	39.1	156,400
Chicken Manure	4,000	cy	1.57	6,300
Molasses	77	55-gal drum	201	15,500
Subtotal Amendments				416,100
Process Sampling				
- Explosives (1 sample per 50 cy soil, Day 1; 1 sample per 50 cy compost, day 15; + 80 samples for contingency)	400	sample	150	60,000
Subtotal Process Sampling				60,000
Labor				
- Field Manager (1 @ 40 hrs/wk, 26 wks)	1,040	hr	36	37,500
- Environmental Engineer (2 @ 40 hrs/wk,52 wks)	4,160	hr	48	199,700
- Equipment Operator (1 @ 40 hrs/wk, 52 wks)	2,080	hr	37	77,000
- Laborer (2 @ 40 hrs/wk, 52 wks)	4,160	hr	25	104,000
Subtotal Labor				418,200
Other Costs				
- Field Trailer	12	month	382	4,600
- Portable Toilet	12	month	93	1,200
- Utilities				
Water	12	month	147	1,800
Electricity	12	month	20	300
Subtotal Other Costs				7,900
Total Annual Composting O&M Costs				902,200
Present Worth Annual Compost O&M Costs(1.25 yrs @ 2.1%Discount Rate) (2)				1,130,000

Table A-2: SWMU 10 - Alternative 2: ***Excavation, Composting, Ground Water Treatment, and Land Use Restrictions***

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
o Ground Water, Extraction, Treatment and Sampling				
- Activated Carbon	1	year	7,080	7,100
- Spent Carbon Disposal	27	55-gal drum	105	2,900
- Influent/effluent sampling for explosives-mont	24	samples	500	12,000
- Semi-annual sampling-Labor	140	hr	48	6,800
- Semi-annual sampling-Analytical	16	sample	170	2,800
- Semi-annual equipment, water disposal	2	ls	4000	8,000
- Data Analysis & Report Preparation	1	ea	15000	15,000
- Utilities	12	month	3,100	37,200
- Field Trailer	12	month	382	4,600
- Trailer Utilities	12	month	20	300
- Environmental Engineer	80	hr	48	3,900
- Misc. repairs	1	ea	1,500	1,500
- System Operator	624	hr	36	22,500
- Project Management and Adminstration	120	hr	55	6,600
Total Annual Groundwater Treatment O&M Costs				131,200
Present Worth Annual GT O&M Costs (8 years @ 3.1% Discount Rate) (2				950,000
Total Present Worth Annual O&M Costs				2,080,000
Subtotal Cost of Alternative				3,500,000
Inflation adjustment (costs based on 1998 dollars,7 %adjusment to 2002 dollars)				245,000
Contingency (@ 20%)				700,000
Total Cost of Alternative				4,450,000

Key to unit abbreviations

cy	cubic yard
day	per day
ea	each
hr	hour
lf	linear foot
ls	lump sum
month	per month
pack	per pack
sample	per sample
sy	square yard
wk	per week
year	per year
55-gallon drum	per 55-gallon drum

(1) Unit cost for each amendment is per cy of soil treated. Cost for each amendment increased by 15 % to account for spillage.
(2) Discount Rates based on U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 2002)

Table A-3: SWMU 10 - Alternative 3: *Excavation, Bio-Slurry (Argonne Process), Groundwater Monitoring, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Direct Capital Costs				
o Bio-Slurry				
Soil Excavation				
- Equipment				
Backhoe	35	day	200	7,000
Front-end Loader	18	wk	1,400	25,200
Soil Screening Plant	35	day	415	14,600
Conveyer Belt (Inclined, 170 feet)	1	ea	38,567	38,600
Steam Cleaner	10	day	75	800
- Labor				
Equipment Operators	400	hr	37	14,800
Laborer	500	hr	25	12,500
- Backfill Excavation	5,000	cy	2	10,000
- Field Test Kits (TNT and RDX)	24	ea	410	9,900
- Confirmatory Samples (2 per batch)	48	sample	150	7,200
- Vegetation and Liner Disposal Cost	6	ton	1,200.00	7,200
- Dispose Decontamination Water	108	55-gal drum	132	14,300
Subtotal Soil Excavation				162,100
Concrete Pad Construction				
- Site Survey	2	day	1,700	3,400
- Silt Fence	1,000	lf	2	2,000
- Site Grading/Clearing	5,178	sy	5	25,900
- Concrete Pad	4,623	sy	41.34	191,200
- Mobilization	1	ea	10,000	10,000
Subtotal Concrete Pad Construction				232,500
Access Road Construction				
- Site Grading/Clearing	1,000	sy	5	5,000
- Aggregate Layer (3-inch Compacted)	1,000	sy	4	4,000
- Asphalt Layer (3-inch)	1,000	sy	5	5,000
Subtotal Access Road Construction				14,000
Treatment System				
- Treatability Study	1	ls	40,000	40,000
- Reactors (Steel, Dia=66 ft, h=15 ft)	2	ea	130,000	260,000
Dual Turbine Mixers	24	ea	10,000	240,000
Slurry Pumps (400 gpm, 50 ft head)	2	ea	14,000	28,000
Diffusers (length=15 ft, width=4 ft)	20	ea	1,000	20,000
Blower (50 scfm @ 27 psi)	4	ea	3,000	12,000
NaOH Storage Tank (2,500 gallons)	2	ea	1,500	3,000
- Water Storage Tank (500,000 gallons)	1	ea	92,872	92,900
Centrifugal Pump (500 gpm, 20 HP)	2	ea	3,270	6,600
- Slurry Mixing Tank (100,000 gallons)	1	ea	28,234	28,300
Dual Turbine Mixers	2	ea	11,000	22,000
Slurry Pumps (400 gpm, 50 ft head)	2	ea	14,000	28,000
- Miscellaneous Plumbing Supplies	1	ls	70,000	70,000
- Makeup Water (from Well 3A)				
Submersible Pump (4-inch, 13 gpm)	2	ea	1,152	2,400
Steel Piping (3-inch, including fittings)	800	lf	26	20,800
Underground Pipe Installation	800	lf	24	19,200
Subtotal Treatment System				893,200

Table A-3: SWMU 10 - Alternative 3: *Excavation, Bio-Slurry (Argonne Process), Groundwater Monitoring, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Slurry Dewatering System				
- Belt Filter Press (135 gpm)	2	ea	159,750	319,500
- Piping (Steel, Dia. = 6 inches)	100	lf	58	5,800
- Dewatered Soil Storage				
Eacavate Storage Lagoon				
- Front-end Loader	1	wk	1,400	1,400
- Equipment Operator	50	hr	37	1,900
Transfer Dewatered Soil to Lagoon				
- Front-end Loader	6	day	273	1,700
- Equipment Operator	84	hr	37	3,200
- Water Recycling				
Piping (Steel, Dia. = 3 inches)	200	lf	30	6,000
Centrifugal Pump (100 gpm, 150 ft head)	2	ea	3,042	6,100
Water Tank (10,000 Gallons)	1	ea	13,500	13,500
Subtotal Slurry Dewatering System				359,100
Site Restoration				
- Steam Cleaner	4	day	75	300
- Laborer	90	hr	25	2,300
- Dispose Decontamination Water	73	55-Gal drum	132	9,700
- Transfer Dewatered Soil to SWMU 10				
Front-end Loader	1.5	wk	1,400	2,100
Equipment Operator	75	hr	37	2,800
Laborer	150	hr	25	3,800
- Dispose Water from Last Batch	645,000	gallon	0.45	290,300
Subtotal Site Restoration				311,300
Monitoring Equipment				
- pH Meter	4	ea	499	2,000
- Dissolved Oxygen Meter	4	ea	1,155	4,700
Subtotal Monitoring Equipment				6,700
o Land Use Restriction	1	ls	5,000	5,000
Subtotal Direct Capital Costs				1,984,000
Indirect Capital Costs				
Engineering and Construction Management (15% of direct costs)				297,600
Health and Safety Equipment & Training (5% of direct costs)				99,200
Legal and Administrative (5% of direct costs)				99,200
Project Management (5% of direct costs)				99,200
System Startup (2% of direct costs)				39,700
Subtotal Indirect Capital Costs				634,900
Total Capital Costs				2,620,000
Annual O&M Costs				
o Bio-Slurry				
Treatment System				
- Molasses	204	55-gal drum	201	41,100
- Sodium Hydroxide	1	yr	12,000	12,000
- Process Sampling				
Explosives (6 samples, Days 1, 10, 20, and 28)	144	sample	150	21,600
TCLP (metals, end of each batch)	12	sample	180	2,200
Subtotal Treatment System				76,900

Table A-3: SWMU 10 - Alternative 3: *Excavation, Bio-Slurry (Argonne Process), Groundwater Monitoring, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Labor				
- Field Manager (1 @ 40 hrs/wk, 9 months)	1,440	hr	36	51,900
- Engineer (1 @ 40 hrs/wk, 3 wks/batch, 6 per yr)	720	hr	48	34,600
- Field Technicians (2 @ 40 hrs/wk, 9 months)	2,880	hr	25	72,000
Subtotal Labor				158,500
Other Costs				
- Field Trailer	9	month	382	3,500
- Portable Toilet	9	month	93	900
- Utilities (for field trailer)	9	month	100	900
- Electricity (for process equipment)	9	month	11,311	101,800
Subtotal Other Costs				107,100
Total Annual Bio-Slurry O&M Costs				342,500
Present Worth Annual Bio-Slurry O&M Costs (1.5 yrs @ 2.1% Discount Rate) (1)				512,000
o Groundwater Monitoring (Semi-annually)				
- Sampling-Labor	140	hr	48	6,800
- Sampling-Analytical	16	sample	170	2,800
- Water disposal, sampling equipment	2	ls	4000	8,000
- Data Analysis & Report Preparation	2	ea	8000	16,000
Total Annual GM O&M Costs				33,600
Present Worth Annual GM O&M Costs (8 years @ 3.1% Discount Rate) (1)				243,000
Total Present Worth Annual O&M Costs				755,000
Subtotal Cost of Alternative				3,375,000
Inflation adjustment (costs based on 1998 dollars,6 %adjusment to 2002 dollars)				202,500
Contingency (@ 20%)				675,000
Total Cost of Alternative				4,260,000

Key to unit abbreviations

cy	cubic yard
day	per day
ea	each
gallon	per gallon
hr	hour
lf	linear foot
ls	lump sum
month	per month
sample	per sample
sy	square yard
wk	per week
55-gal drum	per 55-gallon drum

(1) Discount Rates based on U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 2002)

Table A-4: SWMU 10 - Alternative 3: *Excavation, Bio-Slurry (SABRE Process), Groundwater Monitoring, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Direct Capital Costs				
o Bio-Slurry				
Soil Excavatior				
- Equipment				
Backhoe	35	day	200	7,000
Front-end Loader	18	wk	1,400	25,200
Soil Screening Plant	35	day	415	14,600
Conveyer Belt (Inclined, 170 feet)	1	ea	38,567	38,600
Steam Cleaner	10	day	75	800
- Labor				
Equipment Operators	400	hr	37	14,800
Laborer	500	hr	25	12,500
- Backfill Excavation	5,000	cy	2	10,000
- Field Test Kits (TNT and RDX)	24	ea	410	9,900
- Confirmatory Samples (2 per batch)	48	sample	150	7,200
- Vegetation and Liner Disposal Cost	6	ton	1,200.00	7,200
- Dispose Decontamination Water	108	55-gal drum	132	14,300
Subtotal Soil Excavatior				162,100
Concrete Pad Constructior				
- Site Survey	2	day	1,700	3,400
- Silt Fence	1,000	lf	2	2,000
- Site Grading/Clearing	5,178	sy	5	25,900
- Concrete Pad	4,623	sy	41.34	191,200
- Mobilization	1	ea	10,000	10,000
Subtotal Concrete Pad Constructior				232,500
Access Road Constructior				
- Site Grading/Clearing	1,000	sy	5	5,000
- Aggregate Layer (3-inch Compacted)	1,000	sy	4	4,000
- Asphalt Layer (3-inch)	1,000	sy	5	5,000
Subtotal Access Road Constructioı				14,000
Treatment System				
- Treatability Study	1	ls	40,000	40,000
- Reactors (Steel, Dia=66 ft, h=15 ft)	2	ea	130,000	260,000
Dual Turbine Mixers	24	ea	10,000	240,000
Slurry Pumps (400 gpm, 50 ft head)	2	ea	14,000	28,000
NaOH Storage Tank (2,500 gallons)	2	ea	1,500	3,000
- Water Storage Tank (500,000 gallons)	1	ea	92,872	92,900
Centrifugal Pump (500 gpm, 20 HP)	2	ea	3,270	6,600
- Slurry Mixing Tank (100,000 gallons)	1	ea	28,234	28,300
Dual Turbine Mixers	2	ea	11,000	22,000
Slurry Pumps (400 gpm, 50 ft head)	2	ea	14,000	28,000
- Miscellaneous Plumbing Supplies	1	ls	70,000	70,000
- Makeup Water (from Well 3A)				
Submersible Pump (4-inch, 13 gpm)	2	ea	1,152	2,400
Steel Piping (3-inch, including fittings)	800	lf	26	20,800
Underground Pipe Installation	800	lf	24	19,200
Subtotal Treatment Systen				861,200

Table A-4: SWMU 10 - Alternative 3: *Excavation, Bio-Slurry (SABRE Process), Groundwater Monitoring, and Land Use Restrictions*

Slurry Dewatering System				
- Belt Filter Press (135 gpm)	2	ea	159,750	319,500
- Piping (Steel, Dia. = 6 inches)	100	lf	58	5,800
- Dewatered Soil Storage				
Eacavate Storage Lagoon				
- Front-end Loader	1	wk	1,400	1,400
- Equipment Operator	50	hr	37	1,900
Transfer Dewatered Soil to Lagoon				
- Front-end Loader	6	day	273	1,700
- Equipment Operator	84	hr	37	3,200
- Water Recycling				
Piping (Steel, Dia. = 3 inches)	200	lf	30	6,000
Centrifugal Pump (100 gpm, 150 ft head)	2	ea	3,042	6,100
Water Tank (10,000 Gallons)	1	ea	13,500	13,500
Subtotal Slurry Dewatering System				359,100
Site Restoration				
- Steam Cleaner	5	day	75	400
- Laborer	150	hr	25	3,800
- Dispose Decontamination Water	73	55-Gal drum	132	9,700
- Transfer Dewatered Soil to SWMU 10				
Front-end Loader	3	wk	1,400	4,200
Equipment Operator	150	hr	37	5,600
Laborer	300	hr	25.24	7,600
- Dispose Water from Last Batch	645,000	gallon	0.45	290,300
Subtotal Site Restoration				321,600
Monitoring Equipment				
- pH Meter	4	ea	499	2,000
Subtotal Monitoring Equipment				2,000
o Land Use Restriction	1	ls	5,000	5,000
Subtotal Direct Capital Costs				1,958,000
Indirect Capital Costs				
Engineering and Construction Management (15% of direct costs)				293,700
Health and Safety Equipment & Training (5% of direct costs)				97,900
Legal and Administrative (5% of direct costs)				97,900
Project Management (5% of direct costs)				97,900
System Startup (2% of direct costs)				39,200
User fee				
Subtotal Indirect Capital Costs				626,600
Total Capital Costs				2,590,000
Annual O&M Costs				
o Bio-Slurry				
Treatment System				
- Chemicals including inoculum, starch, pH buffe	5,000	cost per ton	23	115,000
and pH adjustment[1]		of soil		
- Process Sampling				
Explosives (6 samples, Days 1, 10, 20, and 28)	144	sample	150	21,600
TCLP (metals, end of each batch)	12	sample	180	2,200
Subtotal Treatment System				138,800

Table A-4: SWMU 10 - Alternative 3: ***Excavation, Bio-Slurry (SABRE Process), Groundwater Monitoring, and Land Use Restrictions***

Labor				
- Field Manager (1 @ 40 hrs/wk, 9 months)	1,440	hr	36	51,900
- Engineer (1 @ 40 hrs/wk, 3 wks/batch, 6 per yr	720	hr	48	34,600
- Field Technicians (2 @ 40 hrs/wk, 9 months)	2,880	hr	25	72,000
Subtotal Labor				158,500
Other Costs				
- Field Trailer	9	month	382	3,500
- Portable Toilet	9	month	93	900
- Utilities (for field trailer)	9	month	100	900
- Process equipment repairs/replacement	1	ls	5,000	5,000
- Electricity (for process equipment)	9	month	5,000	45,000
Subtotal Other Costs				55,300
Total Annual Bio-Slurry O&M Costs				352,600
Present Worth Annual Bio-Slurry O&M Costs (1.5 yrs @ 2.1% Discount Rate) (1)				527,000
o Groundwater Monitoring (Semi-annually)				
- Sampling-Labor	140	hr	48	6,800
- Sampling-Analytical	16	sample	170	2,800
- Water disposal, sampling equipment	2	ls	4000	8,000
- Data Analysis & Report Preparation	2	ea	8000	16,000
Total Annual GM O&M Costs				33,600
Present Worth Annual GM O&M Costs (8 years @ 3.1% Discount Rate)				243,000
Total Present Worth Annual O&M Costs				770,000
Subtotal Cost of Alternative				3,360,000
Inflation adjustment (costs based on 1998 dollars,6 %adjusment to 2002 dollars)				201,600
Contingency (@ 20%)				672,000
Total Cost of Alternative				4,240,000

Key to unit abbreviations

cy	cubic yard
day	per day
ea	each
gallon	per gallon
hr	hour
lf	linear foot
ls	lump sum
month	per month
sample	per sample
sy	square yard
wk	per week
55-gal drum	per 55-gallon drum

(1) Discount Rates based on U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 20

Table A-5: SWMU 10 - Alternative 4: *Excavation, Off-Post Treatment/Disposal, Groundwater Monitoring, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Direct Capital Costs				
o Incineration				
Soil Excavation				
- Mobilization	1	ls	10,000.00	10,000
- Equipment				
Backhoe	5	wk	1,000.00	5,000
Front-end Loader	5	wk	1,400.00	7,000
Steam Cleaner	2	day	75.00	200
- Labor				
Equipment Operators	450	hr	37.00	16,700
Laborer (for Equipment Decontamination)	250	hr	25.00	6,300
- Backfilling Clean Soil	5,000	cy	10.00	50,000
- Field Test Kits (TNT and RDX)	24	ea	410.00	9,900
- Confirmatory Samples (2 per batch)	48	sample	150.00	7,200
Subtotal Soil Excavation				112,300
Transportation and off-post Incineration	15,000,000	lb	0.17	2,550,000
Other Costs				
- Field Trailer	2	month	382	800
- Portable Toilet	2	month	93	200
- Electricity	2	month	20	100
- Decon Water Collection and Disposal				
550-gallon tank	1	ea	1525	1,600
TCLP Analysis	1	sample	180	200
Explosives Analysis	1	sample	150	200
Disposal	400	gallon	0.35	200
Subtotal Other Costs				3,300
Technical Labor				
- Field Manager	400	hr	36.00	14,400
Subtotal Technical Labor				14,400
Analytical				
- Explosives - Field Testing	140	sample	21.00	3,000
- Explosives - Laboratory	14	sample	190.00	2,700
Subtotal Analytical				5,700
o Land Use Restriction	1	ls	5,000.00	5,000
Subtotal Direct Capital Costs				2,691,000
Indirect Capital Costs				
Engineering and Construction Management (5% of direct costs)				134,600
Health and Safety Equipment & Training (5% of direct costs)				134,600
Legal and Administrative (5% of direct costs)				134,600
Project Management (5% of direct costs)				134,600
Subtotal Indirect Capital Costs				538,400
Total Capital Costs				3,230,000

Table A-5: SWMU 10 - Alternative 4: *Excavation, Off-Post Treatment/Disposal, Groundwater Monitoring, and Land Use Restrictions*

Annual O&M Costs				
o Groundwater Monitoring (Semi-annually)				
- Sampling-Labor	140	hr	48	6,800
- Sampling-Analytical	16	sample	170	2,800
- Water disposal, sampling equipment	2	ls	4000	8,000
- Data Analysis & Report Preparation	2	ea	8000	16,000
Total Annual Groundwater Monitoring O&M Costs				33,600
Present Worth Annual GW O&M Costs (8 years @ 3.1% Discount Rate)				243,000
Total Present Worth Annual O&M Costs				243,000
Subtotal Cost of Alternative				3,473,000
Contingency (@ 20%)				694,600
Total Cost of Alternative				4,170,000

Key to unit abbreviations

cy	cubic yard
day	per day
ea	each
gallon	per gallon
hr	hour
ls	lump sum
month	per month
sample	per sample
wk	per week

(1) Discount Rates based on U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 2002)

Table A-6: SWMU 10 - Alternative 5: ***Multlayer Cap, Groundwater Monitoring, and Land Use Restrictions***

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Direct Capital Costs				
o Multlayer Cap				
Soil sampling and site surveys				
- Soil sampling at pond 5 excavation	25	sample	150.00	3,800
- Cap boundary soil sampling	70	sample	150.00	10,500
- Soil sampling- labor	100	hr	55.00	5,500
- Survey Preparation and Mobilization	1	ls	5,000.00	5,000
- Topographic Survey	2	acres	360.00	720
- Control Survey	1,120	lf	1.17	1,310
- Grading Control (topo. survey each cap layer)	1.6	acres	1,140.00	1,824
- As-Built Survey	2	acres	360.00	720
Subtotal				29,400
Site Work and Cap Installation				
- Well Abandonment	1	ea	5,000.00	5,000
- Temporary Erosion and Sediment Controls	1	ls	4,000.00	4,000
- Site Work Preparation and Mobilization	1	ls	10,000.00	10,000
- Clearing	2	acres	1,000.00	2,000
- Off-post disposal of vegetation	5	ton	1,200.00	6,000
- Excavation of soil from pond 5	155	cy	20.00	3,100
- Placement of soil from pond 5 under cap	155	cy	8.00	1,240
- Soil fill for foundation layer	3,300	cy	12.00	39,600
- Barrier layer: 40 mil HDPE geomembrane	70,000	sf	1.30	91,000
- Barrier layer: Geosynthetic clay liner (GCL)	70,000	sf	1.35	94,500
- Soil drainage layer: drainage netting, 1/4" thick	70,000	sf	0.45	31,500
- Anchor trench	1,120	lf	6.00	6,720
- Protective soil layer	5,200	cy	12.00	62,400
- Protective topsoil cover	1,300	cy	25.00	32,500
- Vegetation	2	acres	16,000.00	32,000
- Perimeter Drainage collection trench, pipe	1,300	lf	20.00	26,000
- Perimeter Riprap Ditch	1,300	lf	15.00	19,500
- Stormwater collection Basin	1	ls	10,000.00	10,000
- Fence	1,500	ft	20.00	30,000
- Field Manager	240	hr	60.00	14,400
- Contractor's Engineer	200	hr	65.00	13,000
- Two general site laborers	320	hr	35	11,200
Subtotal				546,000
o Land Use Restriction	1	ls	5,000.00	5,000
Subtotal Direct Capital Costs				581,000
Indirect Capital Costs				
Engineering and Construction Management (20% of direct costs)				116,200
Health and Safety Equipment & Training (5% of direct costs)				29,100
Legal and Administrative (5% of direct costs)				29,100
Project Management (10% of direct costs)				58,100
Subtotal Indirect Capital Costs				232,500
Total Capital Costs				820,000

Table A-6: SWMU 10 - Alternative 5: *Multlayer Cap, Groundwater Monitoring, and Land Use Restrictions*

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Annual O&M Costs				
o Cap O&M				
- Inspection	1	ls	3,000.00	3,000
- Final Cover System	1	ls	12,000.00	12,000
- Surface Water Managment System	1	ls	1,000.00	1,000
Subtotal				16,000
o Groundwater Monitoring (Semi-annually)				
- Sampling-Labor	140	hr	48	6,800
- Sampling-Analytical	16	sample	170	2,800
- Water disposal, sampling equipment	2	ls	4000	8,000
- Data Analysis & Report Preparation	2	ea	8000	16,000
Subtotal				33,600
o Project Management and Administration (5% of annual O&M costs)				2,480
Total Annual O&M Costs				52,100
Present Worth Annual O&M Costs (30 years @ 3.9% Discount Rate) (1)				950,000
Total Present Worth Annual O&M Costs				950,000
Subtotal Cost of Alternative				1,770,000
Contingency (@ 20%)				**354,000**
Total Cost of Alternative				2,130,000

Key to unit abbreviations

cy	cubic yard
day	per day
ea	each
sf	square feet
hr	hour
ls	lump sum
lf	linear feet
sample	per sample
wk	per week

(1) Discount Rates based on U.S. Office of Management and Budget Circular No. A-94, Appendix C (February 2002)

APPENDIX B:

Groundwater Extraction Well Modeling and Natural Attenuation SWMU 10

APPENDIX B

Groundwater Extraction Well Modeling and Natural Attenuation
SWMU 10

This appendix presents background information used for evaluating the groundwater contaminant plume at SWMU 10. Section B.1 presents a discussion of the potential for natural attenuation to actively remediate the groundwater plume. Section B.2 presents the groundwater extraction well layout discussion for SWMU 10. The primary contaminant at SWMU 10 is RDX.

B.1 NATURAL ATTENUATION EVALUATION

Natural attenuation refers to the advection, biodegradation, dispersion, sorption, volatilization, or chemical and biochemical stabilization of contaminants to effectively reduce contaminant toxicity, mobility, or volume to levels that are protective of human health and the environment. As discussed in "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites", USEPA, Directive 9200.4-17P, April 1999; there are three "lines of evidence" necessary to provide confidence that natural attenuation will provide acceptable remediation:

- Historical groundwater and/or soil chemistry data that demonstrate a clear trend of decreasing contaminant mass and/or concentration over time.

- Hydrogeologic and geochemical data that can be used to demonstrate indirectly the types and rates of natural attenuation processes active at the site.

- Data from field microcosm studies which directly demonstrate the occurrence of a particular natural attenuation process at the site.

Volume III of the Draft Known Releases CMS Report (Dames & Moore, 2000a) presents a detailed evaluation of the physical and chemical processes that affect the migration of RDX and TCE in groundwater at SWMU 10.

Presented below is a discussion of the primary natural attenuation processes and their potential effect on the contaminant plume at SWMU 10.

Advection refers to the transportation of constituents with the flow of groundwater. Dispersion refers to the mechanical and diffusional mixing of constituents in the aquifer. The result is a dilution or reduction in contaminant concentrations. These two processes typically transport constituents from a source area such as a plume; although they reduce contaminant concentrations, they do not reduce the contaminant mass. Advection and dispersion are expected to slowly reduce contaminant groundwater concentrations at the SWMU 10 plume. However, due to the quasi-steady state condition of the plume, the time frame for complete natural attenuation could be significant. Because the plume at SWMU 10 is several miles upgradient of the base boundary, a long time period for complete attenuation should not present any human health risks as long as drinking water restrictions are maintained.

Sorption is the process of constituent partitioning between the aqueous phase and soil in the aquifer matrix. The sorption of constituents onto soil particles (particularly organic carbon) results in the retardation of constituent transport in the aquifer. The degree of retardation achieved through sorption is a function of the contaminant organic carbon partition coefficient, organic carbon content of the soil, soil bulk density, and soil porosity. However, because very little organic carbon is likely in the aquifer soil at TEAD, limited sorption of RDX is anticipated.

Volatilization is the process of constituent partitioning between the aqueous phase in the saturated zone and the nonaqueous phase in the unsaturated zone. The degree of volatilization is a function of constituent volatility or vapor pressure, constituent solubility, soil transmissivity, and depth of water table. Because RDX is not very volatile, this process is not expected to reduce RDX levels.

Biodegradation is a process in which microorganisms partially brake down contaminants into daughter products or completely degrade contaminants. Biodegradation can occur aerobically or anaerobically if the correct conditions exist and microbes are present.

Biodegradation of RDX is not expected to be occurring at SWMU 10 because:

- Current research suggests that RDX is difficult for groundwater microbes to biodegrade.

- The corrosive nature of the aquifer is also unfavorable for microbes.

In conclusion, over time the RDX concentrations will slowly decrease through natural attenuation processes such as advection, dispersion, dilution, and sorption. However, the conditions at SWMU 10 do not appear to be favorable enough for natural attenuation to be considered an active source of groundwater remediation.

B.2 GROUNDWATER EXTRACTION WELL LAYOUT

Preliminary cost estimates for a pump and treat system at SWMU 10 are generated for this CMS report. As part of this effort, the number of extraction wells and the pumping rates need to be estimated. Because of the paucity of active pumping data collected at the SWMUs and lack of vertical geologic data, the well layout and pumping rates should only be considered speculative. This modeling does not estimate cleanup times. However, for the purpose of the cost estimates, 8 years is used.

In general, wells provide two functions, source reduction and hydraulic capture to limit plume migration. Well placement guidelines vary, but effective systems do not pull contamination away from the source and contaminate clean aquifer material. Also, several small pumping wells work more efficiently than one high pumping well. The location of injection wells also effects the overall aquifer response.

The results presented here are based on an uncalibrated model created and used to evaluate zones of capture and potential pumping rates for hypothetical pumping well arrays. Using calibrated aquifer values from the groundwater model presented in the Volume III of the Draft Known Releases CMS report, wells are positioned around the sources of contamination and the model is run until steady state conditions are achieved. Using this process, the well arrays and pumping rates for SWMU 10 were generated. Whereas the model can be expected to simulate aquifer response under ideal and theoretical condition, the model is not calibrated against actual pumping data at SWMU 10 and is not originally designed for pump and treat system optimizations. Therefore, the results presented cannot be considered sufficient for detailed cost design analysis. For the purpose of preliminary design such as in a CMS and data gap identification in support of more detailed future studies the model estimates are considered sufficient.

Figure B-1 presents the location of three extractions wells placed to capture the SWMU 10 RDX plume. The pumping rates for extraction well #1 is 20 gpm and extraction wells #2 and #3 are both 40 gpm. The capture zone and simulated drawdown surface are also shown. Figure B-2 presents a potential layout for extraction and injection wells at SWMU 10.

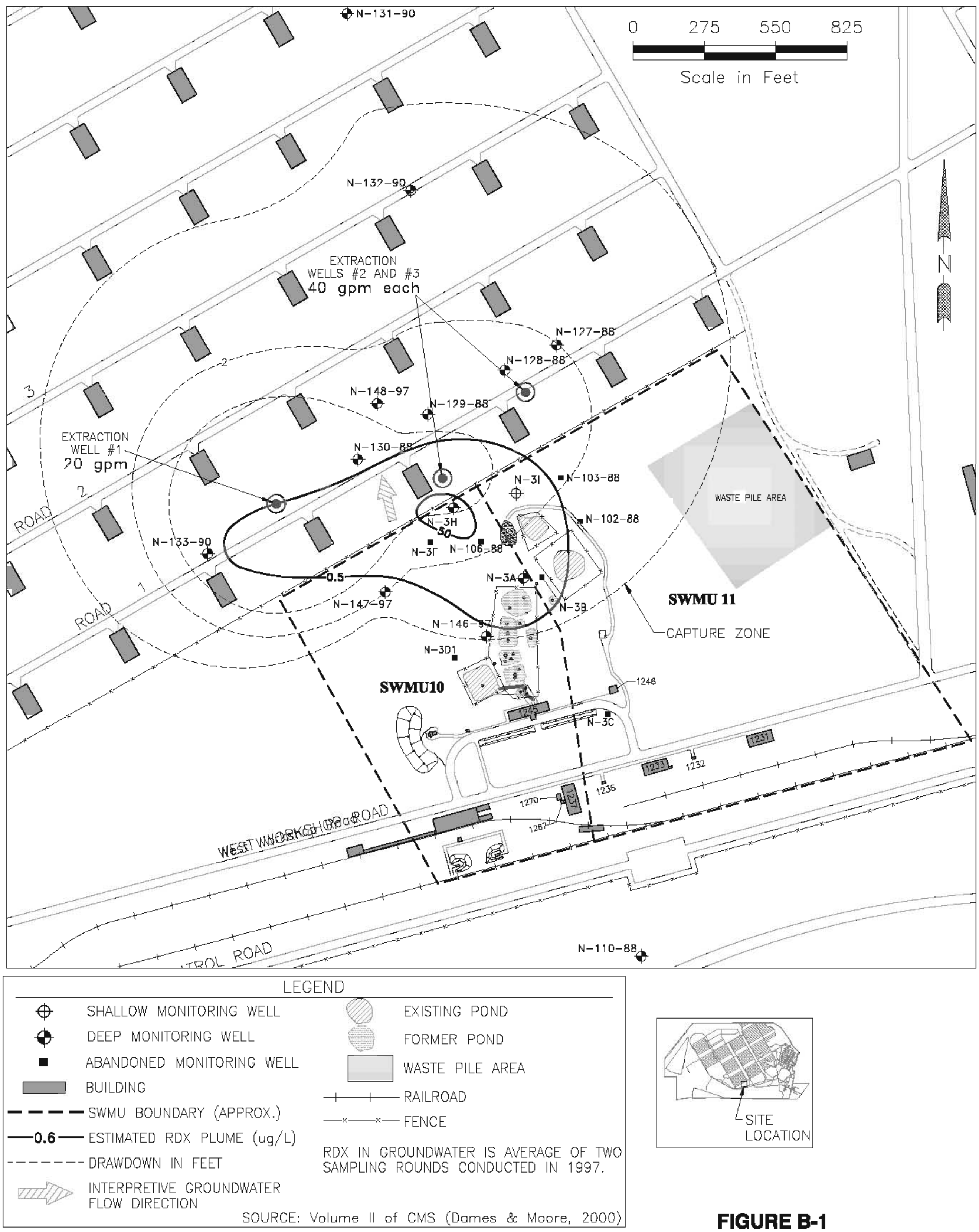

FIGURE B-1
SIMULATED DRAWDOWN AND EXTRACTION WELL LOCATIONS
SWMU 10
TOOELE ARMY DEPOT

URS
Dames & Moore

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LEGEND

- EXTRACTION WELLS
- EXTRACTION PIPELINE, SUBGRADE
- REINJECTION WELLS
- REINJECTION PIPELINE, SUBGRADE
- SWMU BOUNDARY (APPROX.)

SOURCE: RUST E&I, 1995

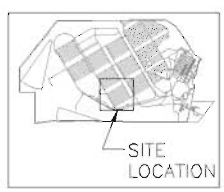

FIGURE B-2
LOCATION OF EXTRACTION AND REINJECTION WELLS
SWMU 10
TOOELE ARMY DEPOT

URS
Dames & Moore

APPENDIX C

Post-Corrective Measures Ecological Risks

APPENDIX C

SUMMARY OF ECOLOGICAL RISKS AT SWMU 10

C.1 INTRODUCTION

Based on the results of the Revised Final Site-Wide Ecological Risk Assessment (SWERA) by Rust Environment and Infrastructure (E&I), 1997 performed at the Tooele Army Depot (TEAD), each solid waste management unit (SWMU) was characterized as either posing low, moderate or potentially unacceptable ecological risk. For those SWMUs characterized as posing unacceptable ecological risk, the SWERA recommended consideration of ecological risk reduction as part of corrective measures to be evaluated based on human health concerns. The purpose of this appendix is to outline the approach utilized in this CMS in the evaluation of ecological risk for Known Releases SWMU 10.

C.2 SUMMARY OF ECOLOGICAL RISKS AT SWMU 10

The SWERA used both a "historic" and a "current" soil data set in the evaluation of ecological risk at SWMU 10. The "historic" data set consists of data obtained through the Installation Restoration Data Management Information System (IRDMIS) database during the 1994 to 1995 time period. Because additional sampling has occurred since 1995 for some SWMUs, there may be differences between the data currently available for each SWMU and the data utilized in the SWERA. The "current" data set consists of data collected by Rust E&I for biotic and abiotic media at the reference study area (RSA-background site) and each SWMU. Potential ecological risks were calculated using the "historic" and/or the "current" data sets for SWMU 10.

Since the two data sets contain different types and amounts of data, ecological risks were estimated using both sets of data independently using different methodologies. For the "historic" data set, ecological risk to various receptors was calculated based on the soil consumption route of exposure only. For the "current" data set, ecological risk to various receptors was calculated using a dynamic food chain model. Thus, risk estimates based on the "current" data set include both soil and prey consumption routes of exposure. For those SWMUs in which both "historic" and "current" data are available, two separate estimates of ecological risk were generated and the higher risk level was used in the SWERA to characterize the risk at each SWMU. The risk classifications are low, moderate, or unacceptable. SWMU 10 was classified as being unacceptable.

Based on the "historic" data set, the primary risk driver and COPC of concern for SWMU 10 is RDX, which accounts for at least 93% of the Hazard Index (HI) for each ecological receptors). However, an interim remedial action has occurred since the historic "data set" was collected – the area has been covered with an impervious synthetic liner and covered with a foot of clean soil. Soil samples collected as part of the "current" data set (post interim action) confirm that no RDX or other explosives exist in the surficial soil cover above the liner. Thus, risk estimates based on the “historic” data set are no longer applicable. Therefore, risk at SWMU 10 is driven by the “current” data set. The primary receptor of concern (classified as an unacceptable risk) is the deer mouse, with exposure through the diet comprising 93% of the HI. The deer mouse HI was 17.1 times greater than at the RSA.

Although actual chemical analyses for RDX were conducted on rabbitbrush and gumweed samples collected at SWMU 10, food chain exposure of the deer mouse to RDX was estimated using a plant uptake model. The model estimated the amount of RDX in plants from soil uptake using a soil-plant transfer factor and an RDX plant elimination factor (Rust E&I, 1997). The fit of the model in relation to the actual chemical measurements made on SWMU 10 vegetation was evaluated. The model evaluation showed that the model underestimated the measured results by 41 times. This is not surprising since, as mentioned, RDX was not detected in the soil at SWMU 10 and one-half the detection limit was substituted for the soil concentration required for the model. Also, the measured amounts of RDX in vegetation varied substantially due to difficulties with the analytical procedure. These factors may have influenced the predictive capability and accuracy of the model. Since there were no detections of RDX in the soil cover (detection limits for soil appeared to sufficiently low), both the analytical results and model results are suspect. In light of these factors, the estimated risk from food chain transfer is suspect and may significantly overestimate actual risk through the food chain pathway.

Because the plant uptake model was based on one-half the detection limit for RDX in soil, and still resulted in a potential unacceptable risk to deer mouse, any future corrective measure actions will not change the risk estimate. This is because the minimum soil concentration used to estimate risk will remain at one-half the detection limit, even for clean soil. However, even if the model and vegetation chemical analyses are valid, from a risk management point-of-view, the predicted risk can still be mitigated.

Each of the first four corrective measures evaluated for SWMU 10 in this CMS involve excavation of the contaminated soil and treating the soil by one of the following methods: soil composting, bioslurry activities, or off-site disposal. This will be followed by backfilling with the treated clean soil. The fifth corrective measure involves placing an impermeable multilayer cap over the contaminated soil. All of these corrective measure options will involve the removal of any vegetation currently on site, and thus the current vegetation exposure pathway will not be of concern. (The vegetation is disposed of properly in each alternative.) Additionally, once the remedial activities are completed any new vegetation growth will occur on clean soil and exposure through the food chain pathway will not be an issue.

In summary, the predicted unacceptable ecological risk for SWMU 10 is driven by RDX in the food chain pathway for the deer mouse. The proposed actions will remove current vegetation and vegetation re-growth will occur on clean soil. Thus, all of the proposed corrective measures are equally effective in reducing the ecological risk to acceptable levels.

APPENDIX D

SESOIL MODEL

APPENDIX D

SESOIL MODEL

D.1 INTRODUCTION

Solid Waste Management Unit (SWMU) 10 requires corrective action to meet Depot worker CAOs for TNT and RDX in soil. As part of the CMS evaluation for SWMU 10, a model was developed to estimate the future TNT and RDX leachate concentrations at the water table after soil treatment. The estimation was conducted using SESOIL (**SE**asonal **SOIL**) software to model leachate movement downward through the vadose zone.

Utah's "Principle of Non-degradation" requires that soil contamination does not increase existing levels of groundwater contamination. This model is used to determine whether site soil that has been treated to Depot Worker CAOs could still contribute constituents to groundwater through leaching. TNT and RDX concentrations are currently above CAOs to a depth of 7 feet bgs. The site will be treated based on surface soil CAOs (0 to 2 feet bgs) and subsurface soil CAOs (below 2 feet bgs). The primary objective of the SEOIL application is to determine whether there is measurable RDX and TNT in any leachate that may be produced from precipitation at the SWMU once the soil is treated to Depot Worker CAOs.

D.2 SESOIL

SESOIL is a one-dimensional vertical transport program for the unsaturated soil zone and is designed to perform long-term seasonal simulations of solute distribution in the soil profile. The model considers one compound at a time and is based on mass balance and equilibrium partitioning of the chemical between different phases (dissolved (e.g., leachate), sorbed, vapor, and pure).

SESOIL performs long-term simulations of chemical transport and transformations in soil. SESOIL accepts time-varying pollutant loading and uses theoretically-derived equations to represent water transport, sediment transport on the land surface, pollutant transformation, and migration of the pollutant to the atmosphere and groundwater. Climatic data, compartment geometry, and soil and chemical property data are the major components used in the equations. Output of SESOIL includes time-varying pollutant concentrations at various soil depths and pollutant loss from the unsaturated zone in terms of surface runoff, percolation to the groundwater, volatilization, and degradation.

D.3 INPUT

Site-specific information was used to create the SESOIL input files, drawing on the *Supplemental Chromium Investigation Final Report for Tooele Army Depot* (USACE,

1999) for much of the data. The parameters in the referenced effort are used to the extent that they are appropriate for SWMU 10. For example, climate data and much of the vadose zone characteristic data are incorporated unchanged. Only those input parameters that changed (e.g., layers, chemical data) for SWMU 10 are described herein. The variables for each input file are defined in Tables D-1 through D-4. These tables also provide variable-specific comments that present the rationale of the selected variable values. The values are a combination of site-specific information and default SESOIL values.

The soil column at the site was modeled in a four-layer system that extends from the ground surface to the top of the water table. Layer 1 (starting at the surface) is the remediated soil layer, and was assumed to be 7 feet thick. This layer is assumed to contain TNT and RDX soil concentrations equal to their Depot Worker CAOs. Below the surface layer, Layers 2, 3, and 4 were delineated based on the log for soil boring N-146-97 (attached). Because there is good comparability in soil types (not thicknesses) between boring N-146-97 and the borings presented in the *Supplemental Chromium Investigation Final Report*, the model soil characteristics are transferred from that effort. To summarize, the layers are set as follows:

Layer 1: treated soil layer
Layer 2: first native soil layer, silty gravel with sand and clay
Layer 3: intermediate native soil layer, clay and silty clays (aquitard)
Layer 4: gravels with clay and sand.

To provide a range of values for comparison, the model was run twice for each contaminant using two different sets of input parameters for the residual soil TNT and RDX concentration in soil. One model run used only the conservative surface soil CAOs for the entire remediated soil layer; the residual soil RDX and TNT concentrations were set equal to the surface soil CAOs of 31 µg/g and 86 µg/g, respectively. The second model run used only the subsurface soil CAOs for the entire remediated soil layer. For this run, the residual soil RDX and TNT concentrations were set equal to the subsurface CAOs of 200 µg/g and 710 µg/g, respectively.

Variables and assumptions specific to this modeling effort are summarized below (and detailed in Tables D-1 through D-4).

- The amount of remediated soil is 5,500 cubic yards (yd^3) over an area of 0.489 acre, correlating to a thickness of 7 feet.

- As for the IWL model, rainfall that will generate leachate is described in the climatologic data set for Grantsville, Utah. This data set also provides the climate data necessary for SESOIL to estimate loss of moisture by evapotranspiration.

- The average depth of the water table is 79.3 meters.

- Loss of contamination from the source by soil erosion is assumed to not occur.

- Loss of contamination from the vadose zone soil layers by volatilization is assumed to not occur.

- Contaminant removal from any leachate via hydrolysis or complexation within the vadose zone is assumed to not occur (a conservative assumption).

D.4 RESULTS

Results for each set of variables modeled are summarized in Table D-5. The SESOIL model results estimate that a remediated soil layer RDX concentration of 31 µg/g may allow RDX to reach the water table by year 80 of the model. However, the RDX concentration in the leachate at both year 80 and year 200 of the model is only 0.06 µg/L, i.e., well below detection limit. The results for a remediated soil layer RDX concentration of 200 µg/g are identical to the results for a RDX concentration of 31 µg/g.

The SESOIL model results estimate that a remediated soil layer TNT concentration of 86 µg/g will allow TNT to leach only to a depth of 6.55 meters below surface by model year 200. The concentration of TNT in the leachate at this depth at year 200 is 0.018 µg/L. The results for a remediated soil layer TNT concentration of 710 µg/g are nearly identical to the results for a TNT concentration of 86 µg/g.

D.5 CONCLUSIONS

The SESOIL model was performed for SWMU 10 using site-specific conditions to determine if treating soil to Depot Worker CAOs will degrade groundwater via soil leaching.

The model was run using two RDX soil concentrations: the surface soil CAO and the subsurface soil CAO. Both runs had identical results and indicate that, although RDX will reach the water table by model year 80, concentrations are well below levels of concern. The RDX concentration in the leachate at both year 80 and year 200 of the model runs was only 0.06 µg/L. Therefore, no increase in groundwater RDX levels would be expected from this low leachate concentration.

The dilution factor between leachate and the receiving groundwater is very large for this site due to the small amount of precipitation at TEAD. Thus the very small leachate concentration of 0.06 µg/L that may actually reach the water table may be diluted in the groundwater and result in a negligible contribution of RDX in groundwater.

The model was also run for TNT at two soil concentrations: the surface soil CAO and the subsurface soil CAO. Both runs had nearly identical results and indicated that TNT will reach a maximum depth of 6.55 meters below surface by model year 200.

Therefore, post-remedial TNT soil concentrations are not expected to result in TNT leachate reaching groundwater.

In summary, the SESOIL model results indicate that soil treatment to either surface or subsurface Depot Worker CAOs for RDX and TNT is protective of groundwater at SWMU 10.

TABLE D-1
SESOIL *Chemical File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE		REFERENCE/COMMENT
			RDX	TNT	
NCH	Index number for the chemical data set	--	1	2	- -
TITLE	Chemical data set title	--	SWMU 10	SWMU 10	- -
SL	Solubility in water	ug/ml (ppm)	60	130	Agency for Toxic Substances and Disease Registry, Web Site - www.atsdr.cdc.gov/toxprofiles
DA	Air diffusion coefficient	cm^2/sec	0	0	Assumes no attenuation of contaminant concentrations by vapor-phase transport of lead upward and out of the soil column.
H	Henry's Law Constant	m^3-atm/mol	1.20E-05	4.57E-07	Agency for Toxic Substances and Disease Registry, Web Site - www.atsdr.cdc.gov/toxprofiles
KOC	Organic carbon adsorption coefficient	(ug/g)/(ug/ml)	63.1	1100	Agency for Toxic Substances and Disease Registry, Web Site - www.atsdr.cdc.gov/toxprofiles
K	Soil partition coefficient, often specified K_d in the literature.	(ug/g)/(ug/ml)	0.001	4	Agency for Toxic Substances and Disease Registry, Web Site - www.atsdr.cdc.gov/toxprofiles
MWT	Molecular weight of chemical.	g/mol	222.26	227.13	Agency for Toxic Substances and Disease Registry, Web Site - www.atsdr.cdc.gov/toxprofiles
VAL	Valance	--	0	0	
KNH	Neutral hydrolysis rate constant	L/mol/day	0	0	Contaminant attenuation by hydrolysis is currently not applicable.
KBH	Base hydrolysis rate constant (CRREL: "Base catalyzed hydrolysis constant")	L/mol/day	0	0	Contaminant attenuation by hydrolysis is currently not applicable.
KAH	Acid hydrolysis rate constant (CRREL: "Base catalyzed hydrolysis constant:)	L/mol/day	0	0	Contaminant attenuation by hydrolysis is currently not applicable.

TABLE D-1
SESOIL *Chemical File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE		REFERENCE/COMMENT
			RDX	TNT	
KDEL	Liquid-phase biodegradation rate	1/day	0	0	Values entered for KOC, K, KDEL, and KDES are assumed to be for the first soil layer and are used as a reference point for the other layers per the layer-specific ratios input to the application file.
KDES	Solid-phase biodegradation rate	1/day	0	0	Values entered for KOC, K, KDEL, and KDES are assumed to be for the first soil layer and are used as a reference point for the other layers per the layer-specific rations input to the application file.
SK	Ligand stability (dissociation) constant	--	0	0	Contaminant attenuation by complexation of cations is assumed to not occur.
B	Moles ligand per mole compound	--	0	0	Contaminant attenuation by complexation of cations is assumed to not occur.
MWTLIG	Molecular weight of ligand	g/mol	0	0	Contaminant attenuation by complexation of cations is assumed to not occur.
NCH	End of chemical data file	--		999	

TABLE D-2

SESOIL *Soil File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
NSO	Index number for soil data set	--	1	--
TITLE	Soil data set title	--	Tooele Loam	--
RS	Bulk density	g/cm^3	1.8	This is the average dry bulk density for the entire soil profile. SESOIL does not allow it to be layer-specific. The selected value corresponds to the value specified in the IWL model (USACE, 1999).
K1	Intrinsic permeability	cm^2	8E-10	This is the average intrinsic permeability for the *entire soil profile*. If a value of zero is specified for K1, then layer-specific intrinsic permeability values must be specified in the application file. The selected value corresponds to the midpoint of the range specified for soil types ranging from clay to sand in Table 4.3 of ORNL, 1996.
C	Soil pore disconnectedness index	--	4	Values typically range from 3.7 for sand to 12.0 for fine clay. The selected value corresponds to the value specified in the IWL model (USACE, 1999).
N	Effective porosity	--	0.25	This is the effective porosity for the entire soil profile. N = (1-Sr) x nt where nt is porosity (voids / total volume) and Sr is residual medium saturation (volume of water unremoved by natural forces / volume voids). N generally has value close to nt. Typical values of N range from 0.2 to 0.4. The selected value is from JMM (1988).
OC	Organic carbon content	percent	0.01	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
CEC	Cation exchange capacity	meg/100g	6	The selected value corresponds to the value specified in the IWL model (USACE, 1999). As a point of comparison, Table 16 of USDA (2000) reveals CEC values for Tooele soils on the order of 15 meg/100g (implying greater contaminant attenuation capacity).
FRN	Freundlich exponent	--	1	This is the default SESOIL value. A value of 1 means adsorption is linear. Values typically range from 0.9 to 1.4.
NSO	End soil data file	--	999	

JMM, 1998. *Groundwater Quality Assessment Engineering Report*, prepared for U.S. Army Corps of Engineers, Huntsville, Alabama.
Oak Ridge National Laboratory (ORNL), 1996, Radiation Safety Information Computational Center (RSICC) Computer Code Collection-SESOIL, Report CCC-629.
USDA, 2000. *Soil Survey of Tooele Area, Utah*; US Dept of Agriculture; Natural Resources Conservation Service.

TABLE D-3
SESOIL *Application File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
NAP	Index number for application data set	--	1	--
TITLE	Application data set title	--	TEAD SWMU 10	--
ILYS	Number of soil layers	--	4	Default value of the maximum number of major layers allowed by SESOIL, to facilitate greatest definition of vertical soil chemical concentration profile.
IYRS	Number of years of annual data in the application file	--	1	--
AR	Application area (CRREL: "surface area of the compartment")	cm^2	0.00E+00	AR value affects mass flux calculations only, not resultant soil and soil mositure contaminant concentrations. Therefore, the variable AR is not important for the present application of SESOIL.
L	Latitude of site	degrees	40.5	--
ISPILL	Spill index (spill = 1; steady = 0)	--	0	ISPILL = 1 only applies to the first layer. ISPILL = 1 is instantaneous spill(s) occurring at the beginning of the first month of the simulation. ISPILL = 0 is continuous loading rate occurring throughout the first month of the simulation (30 equal parts for the 30 time-steps of the month).
D1	Upper soil layer thickness	cm	213	D1, D2, D3, and D4 sum to 7925 cm, which is the average depth to the water table (at time of drilling) as presented in the attached boring log N-146-97. D1 thickness corresponds to waste source thickness of 7 feet.
D2	Second soil layer thickness	cm	2073	Estimated from the attached boring log N-146-97.
D3	Third soil layer thickness	cm	2103	Estimated from the attached boring log N-146-97.
D4	Lower soil layer thickness	cm	3536	Estimated from the attached boring log N-146-97.
NSUB1	Number of sublayers in upper soil layer	--	1	Reduces model run time and output data file size, without compromizing findings.
NSUB2	Number of sublayers in second soil layer	--	1	Reduces model run time and output data file size, without compromizing findings.
NSUB3	Number of sublayers in third soil layer	--	1	Reduces model run time and output data file size, without compromizing findings.
NSUB4	Number of sublayers in lower soil layer	--	1	Reduces model run time and output data file size, without compromizing findings.

TABLE D-3

SESOIL *Application File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
PH1	pH of upper soil layer	--	0	Value only needs to be specificed if hydrolysis is considered. Hydrolysis is not currently a modeled contamination attenuation process.
PH2	pH of second soil layer	--	0	See variable PH1 comment.
PH3	pH of third soil layer	--	0	See variable PH1 comment.
PH4	pH of lower soil layer	--	0	See variable PH1 comment.
K11	Permeability of the upper soil layer (CRREL: "Intrinsic Permeability")	cm^2	1.5E-09	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
K12	Permeability of the second soil layer (CRREL: "Intrinsic Permeability")	cm^2	3.E-09	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
K13	Permeability of the third soil layer (CRREL: "Intrinsic Permeability")	cm^2	7.E-12	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
K14	Permeability of the lower soil layer (CRREL: "Intrinsic Permeability")	cm^2	3.E-09	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
KDEL2	Ratio of KDEL (liquid phase biodegradation) layer 2 to 1	--	1	--
KDEL3	Ratio of KDEL (liquid phase biodegradation) layer 3 to 1	--	1	--
KDEL4	Ratio of KDEL (liquid phase biodegradation) layer 4 to 1	--	1	--
KDES2	Ratio of KDES (solid phase biodegradation) layer 2 to 1	--	1	--
KDES3	Ratio of KDES (solid phase biodegradation) layer 3 to 1	--	1	--
KDES4	Ratio of KDES (solid phase biodegradation) layer 4 to 1	--	1	--
OC2	Ratio of OC (organic carbon content) layer 2 to 1	--	1	--

TABLE D-3
SESOIL *Application File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
OC3	Ratio of OC (organic carbon content) layer 3 to 1	--	1	--
OC4	Ratio of OC (organic carbon content) layer 4 to 1	--	1	--
CEC2	Ratio of CEC (cation exchange capacity) layer 2 to 1	--	1	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
CEC3	Ratio of CEC (cation exchange capacity) layer 3 to 1	--	1.83	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
CEC4	Ratio of CEC (cation exchange capacity) layer 4 to 1	--	0.55	The selected value corresponds to the value specified in the IWL model (USACE, 1999).
FRN2	Ratio of FRN (Freundlich exponent) layer 2 to 1	--	1	--
FRN3	Ratio of FRN (Freundlich exponent) layer 3 to 1	--	1	--
FRN4	Ratio of FRN (Freundlich exponent) layer 4 to 1	--	1	--
ADS2	Ratio of ADS (layer 2, organic carbon adsorption coefficient) to K (organic carbon adsorption coefficient from the chemical file, layer 1)	--	1	--
ADS3	Ratio of ADS (layer 3, organic carbon adsorption coefficient) to K (organic carbon adsorption coefficient from the chemical file, layer 1)	--	1	--

TABLE D-3
SESOIL *Application File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
ADS4	Ratio of ADS (layer 4, organic carbon adsorption coefficient) to K (organic carbon adsorption coefficient from the chemical file, layer 1)	--	1	--
POLIN#	Monthly contaminant load for layer number #	$ug/cm^2/month$	RDX @ 31 μg/g - 11905 RDX @ 200 μg/g - 76809 TNT @ 86 μg/g - 33028 TNT @ 710 μg/g - 272674	Monthly pollutant load (mass per unit area) entering the top sublayer of the top major soil layer. POLIN=CONC*L*RS, where: CONC is the concentration sorbed to the soil in ug/g or ppm, L is the thickness of the sublayer in centimeters which the pollutant is aplied, RS is the bulk density of the soil. For the present application, RS = $1.8 g/cm^3$; L = 213.36 cm; and CONC = 31 ug/g and 200 μg/g (2 trials) for RDX and 86 μg/g and 710 μg/g (2 trials) for TNT.
TRANS#	Monthly mass transformed by other process (ug/cm^2), for layer number #	ug/cm^2	0	Loss of contaminant by other transformation processes not modeled.
SINK#	Monthly mass removed by some other processes (ug/cm^2), for layer number #	ug/cm^2	0	Loss of contaminant by other processes not modeled.
LIG#	Monthly input ligand mass (ug/cm^2), for layer number #	ug/cm^2	0	Loss of contaminant by complexation reactions not modeled.
VOLF#	Index of volatilization, for layer number # (CRREL: Index of volatilization-diffusion occurrence from each layer)	--	0	RDX and TNT are considered to be non-volatile.
ISMR	Index of contaminant transport in surface runoff (CRREL: Index of subsurface pollutant runoff)	--	0	Contaminant loss by erosion not modeled.

TABLE D-3
SESOIL *Application File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
ASL	Ratio of the contaminant concentration in precipitation to the maximum water solubility	--	0	Contamination from precipitation not modeled.
NAP	End of the application data file when NAP = 999	--	999	--

U.S. Army Corps of Engineers (USACE), 1999, *Supplemental Chromium Investigation Final Report for Tooele Army Depot.*

TABLE D-4
SESOIL *Execution File* input variables: TEAD SWMU 10

VARIABLE	DESCRIPTION	UNITS	CURRENT VALUE	COMMENT
RUN	Incremental number for the model run	--	1	--
OPTN	Simulation option ("M" for monthly; "A" for annual)	--	M	Model gives poor results in 'A' mode. SESOIL default mode is 'M' mode.
CLIM	The index number for the climate data file for the model run	--	1	--
SOIL	The index number for the soil data file for the model run	--	1	--
CHEM	The index number for the chemical data file for the model run	--	1	--
WASH	The index number for the washload data file for the model run	--	0	Current application of SESOIL ignores contaminant loss by erosion.
APPL	The index number for the application data file for the model run	--	1	--
YRS	The number of years to simiulate	--	200	--
NEX	File end	--	999	--

TABLE D-5

SESOIL Results Summary
RDX and TNT Leachate in Soil: TEAD SWMU 10

Analyte	Soil Concentration (µg/g)	Soil Layer (1)	Average Leachate Concentration in Layer (µg/mL)					
			Year 1	Year 10	Year 20	Year 40	Year 80	Year 200
RDX	31	1	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01
		2	1.92E-01	3.77E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01
		3	0	0	5.90E+01	6.00E+01	6.00E+01	6.00E+01
		4	0	0	7.23E-01	6.00E+01	6.00E+01	6.00E+01
Maximum depth of RDX (meters bgs) (2)			2.66E+00	2.33E+01	4.48E+01	7.42E+01	7.93E+01	7.93E+01
RDX	200	1	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01
		2	1.92E-01	3.77E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01
		3	0	0	5.90E+01	6.00E+01	6.00E+01	6.00E+01
		4	0	0	7.23E-01	6.00E+01	6.00E+01	6.00E+01
Maximum depth of RDX (meters bgs) (2)			2.66E+00	2.33E+01	4.48E+01	7.42E+01	7.93E+01	7.93E+01
TNT	86	1	2.12E+01	1.30E+02	1.30E+02	1.30E+02	1.30E+02	1.30E+02
		2	0	0	0	0	2.68E+00	1.77E+01
		3	0	0	0	0	0	0
		4	0	0	0	0	0	0
Maximum depth of TNT (meters bgs) (2)			3.63E-02	3.66E-01	7.31E-01	1.46E+00	2.81E+00	6.55E+00
TNT	710	1	1.30E+02	1.30E+02	1.30E+02	1.30E+02	1.30E+02	1.30E+02
		2	0	0	0	0	2.68E+00	1.77E+01
		3	0	0	0	0	0	0
		4	0	0	0	0	0	0
Maximum depth of TNT (meters bgs) (2)			3.63E-02	3.66E-01	7.31E-01	1.46E+00	2.81E+00	6.55E+00

(1) The depth in meters bgs for the bottom of each soil layer is as follows:
- soil layer 1: 2.13 meters (depth of contamination above CAOs)
- soil layer 2: 22.9 meters
- soil layer 3: 43.9 meters
- soil layer 4: 79.3 meters (average water table occurs at 79.3 meters bgs)

(2) This represents the maximum depth that TNT or RDX leachate reached in a given model run duration.

DAMES & MOORE GROUP

LITHOLOGY LOG

SWMU No. 10/11		Site ID N-146-97	
Project Name TEAD Additional Data Collection Activities	Project No. 09604-056	Coordinates NAD 27, UTM-meters E-381604.98734, N-4484594.05822	
Drilling Company LAYNE-CHRISTENSEN	Driller RANDY THOMPSON DEAN WALTON	Ground Elevation NGVD 1929 4727.640 *	Total Drilled Depth 271.5
Drilling Equipment SCHRAMM 850/350	Drilling Method REVERSE AIR ROTARY; Boring Diameter 15" & 9 7/8"	Date/Time Drilling Started 4-7-97/1415	Date/Time Total Depth Reached 4-14-97/1040
Type of Sampling Device SPLIT BARREL SAMPLER 3" x 1.5'		Water Level (BGS) First 253.0 ft	Final 253.55 ft
Sample Hammer Type SPT	Driving Wt. 140 lbs Drop 30"	Hydrogeologist M. BOIBIN	Checked by/Date GAP 4/16/97

Location Description (include sketch in field logbook) APPROX 30' WEST & 300' NORTH OF THE NORTHWEST CORNER OF BLD 1245, SEE SKETCH LOG BOOK DM-03 P28

Depth (ft)	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
0.0–2				SAND: FINE, POORLY GRADED, LT YELLOWISH BROWN, 2.5Y 6/4	SP		D	0	100	0	FIRST 60 ft CUTTINGS WERE LOGGED, FOR A DETAILED LOG SEE LITH LOG FOR BORING TNTSB53
2–8											BACKGROUND DURING DRILLING SOUND = 65 dB DUST = 0.4 mg/m3 LEL = 0% THE FOLLOWING READINGS ARE PEAK DURING DRILLING
8–10			NA	SAND: FINE, SUBROUNDED, POORLY GRADED PALE YELLOW, 2.5Y 7/4	SP		M	0	100	0	PID = 0.0 ppm DUST = 0.7 mg/m3 SOUND = 81 dB LEL = 0%
10–13											

* Subtract 1.36' from elevation to get actual elevation due to surveyors choice of benchmark.

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SWMU No. 10/11

Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample type, depth, tag number, or organic vapor measurements, etc.)
13											
14											
15											
16											
17											
18–20	18–20	18–20	NA	SAND: VY FINE GRAINED, OLIVE YELLOW 2.5Y6/6 SUBANGULAR, QUARTZOSE	SP		M	-	100	-	PID = 2.2 ppm DUST = 0.7 mg/m3 LEL = 0%
21											
22											
23–25	23–25	23–25	NA	SILTY SAND: VY FINE GRAINED POORLY GRADED 2.5Y 6/4, LIGHT YELLOWISH BROWN, WET @ 25 ft.	SM		M	0	65	35	PID = 0.0 ppm
25–27	25–27	25–27	NA	SILTY SAND, AS ABOVE	SM		W				PID = 0.0 ppm
28–30	28–30	28–30	NA	SILT: SOFT, 2.5Y7/2, LT GRAY, CLAYEY INTERVALS, LOW PLAS.	ML					100	PID = 2.5 ppm DUST = 1.1 mg/m3 LEL = 0%

0330-001/JUN19

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LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Dept.	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
30											
31											
32											
33											
34			NA	SANDY SILT: 2.5Y6/6, OLIVE YELLOW, SOFT, LOW PLAS; VY FINE SAND LENSES.	ML		M	-	30	70	PID = 2.5 PPM
35											
36											
37											
38											
39											
40			NA	SILTY SAND: VY FINE GRAINED SAND, POORLY GRADED, 2.5Y7/3, PALE YELLOW	SM		M	-	70	30	PID = 0.0 PPM DUST = 1.3 MG/M3 LEL = 0%
41											
42											
43											
44											
45											
46											
47											

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DAMES & MOORE

LITHOLOGY LOG (continued)

SWMU No. 10/11 | Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (Include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Estimate % of Gr	Sa	Fi	Remarks (Include all sample type, depth, tag number, or organic vapor measurements, etc.)
47											
48											
49											
50–52	↓	↓	NA	SILTY SAND: VY FINE GRAINED, VY POORLY GRADED SAND, 2.5Y 6/4, LT YELLOWISH BROWN.	SM		M	–	60	40	PID = 3.2 ppm DUST = 1.7 mg/m3 SOUND = 97dB LEL = 0%
53											
54											
55											
56											
57											
58											
59											
60–62	↓	↓	NA	SANDY SILT: MED STIFF, LOW PLASTICITY, 2.5Y 6/6 OLIVE YELLOW. VY FINE SAND INTERVALS	ML		M/W	–	45	55	PID = 5.7 ppm
63											
64											

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DAMES & MOORE GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (Include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
64–67											
68–70	68–70		NA	SAND: VY FINE, VY POORLY GRADED, ROUNDED, 10YR6/1, GRAY, DENSE, QUARTZOSE	SP		M	-	95	5	PID = 0.0 ppm DUST = 0.5 mg/m3 LEL = 0% SOUND = 97 dB
70–73											
73.5–75	73.5–75		15 35 40	SAND: AS ABOVE, VY FINE, VY POORLY GRADED, 10YR7/4, VY PALE BROWN, TRACE FINE GRAVEL, ROUNDED	SP		D	5	90	5	PID = 0.0 ppm DUST = 1.5 mg/m3 LEL = 0%
75–81											

LITHOLOGY LOG (continued)

SWMU No. 10/11 | Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (Include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Estimate % of Gr	Sa	Fi	Remarks (Include all sample type, depth, tag number, or organic vapor measurements, etc.)
81											
82											
83											
84	83.5–85		18 50/4 Ref	SAND: V4 FINE SAND, V4 POORLY GRADED, 10YR6/6, BROWNISH YELLOW, V4 DENSE, COARSE SAND LENSE, TRACE FINE GRAVEL, ROUNDED	SP		D	2	95	3	PID = 0.0 ppm Dust = 0.7 mg/m3 LEL = 0% Sound = 97 dB
85											
86											
87											
88											
89											
90											
91											
92											
93	93–95	93–95	NA	SAND: MEDIUM SIZE W/ FINE & COARSE GRAINED PRESENT, LIGHT YELLOWISH BROWN, 10YR6/4, FINE GRAVE LENSES PRESENT, SUBANGULAR	SW/SP		D	15	85	-	PID = 0.0 ppm
94											
95											
96											
97											
98											

DAMES & MOORE GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
98											
99											DUST = 1.8 mg/m3 SOUND = 102 dB LEL = 0%
100											
101											
102											
103											
104			50/2 REF	ZERO RECOVERY - QUARTZITE COBBLE IN SHOE OF SAMPLER, PREVENTED ANY SAMPLE FROM BEING COLLECTED							
105											
106											
107											
108											
109											
110			NA	GRAVELLY SAND: MED SAND POORLY GRADED 10YR5/4 YELLOWISH BROWN, GRAVEL, FINE POORLY GRADED, ROUNDED. CLAYEY INTERVAL @ 111 ft	SW		D	30	55	15	COMPOSITE CUTTINGS SAMPLE PID = 0.0 ppm
111											
112											
113											
114											
115											

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DAMES & MOORE GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample type, depth, tag number, odor, organic vapor measurements, etc.)
115											
116											
117											
118–120			NA	GRAVELLY SAND: FINE-COARSE, MODERATELY WELL GRADED, 10YR6/6, BROWNISH YELLOW, SUB-ROUNDED. GRAVEL FINE-MED, SUBROUNDED, POORLY GRADED, PREDOM. FINE	SW		D	20	75	5	COMPOSITE CUTTINGS SAMPLE PID=0.0ppm
121											
122											
123–125			NA	SILTY CLAY, 5GY7/1, LIGHT GREENISH GRAY, HIGH PLASTICITY, DRY STRENGTH	CL		M	5	-	95	COMPOSITE CUTTINGS SAMPLE PID=3.5ppm
125.5–127			12 18 25	SANDY SILTY CLAY: LEAN CLAY, LOW-MED PLASTICITY, 5GY7/1, LT GREENISH GRAY, HIGH DRY STRENGTH, FINE SAND LENSE PRESENT	CL		M	-	10	90	
128											Dust = 0.4 mg/m3 LEL = 0% Sound = 81 dB
129											
130											
131											
132											

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LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
132											
133–135			NA	SILTY CLAY: ~~SOFT~~, MED PLASTICITY, 5GY4/1 GREENISH GRAY, HIGH DRY STRENGTH	CL		M	-	-	100	COMPOSITE CUTTINGS SAMPLE PID=0.0 ppm
137				SANDY GRAVEL @ 137 ft							
140–142			NA	SANDY GRAVEL: FINE GRAVELS, QUARTZITE & VOLCANIC LITHIC CLASTS, FINE-COARSE SAND, WELL GRADED	GP		D	70	20	10	COMPOSITE CUTTINGS SAMPLE PID=0.0 ppm
143.5–145			25 50/4 LCF	GRAVELLY SAND: FINE-COARSE, MODERATELY WELL GRADED, PREDOM. MED SIZE, 5YR4/3, LT REDDISH BROWN, DENSE, SUBROUNDED	SW		D	25	70	5	
146											DUST=0.7 mg/m³ SOUND=92 dB LEL=0%

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DAMES & MOORE

GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Estimate % of Gr	Sa	Fi	Remarks (Include all sample type, depth, tag number, or organic vapor measurements, etc.)
149											
150–152	↓	↓	NA	GRAVELLY SAND: FINE-COARSE SAND, WELL GRADED 7.5YR6/3 LIGHT BROWN, GP INTERVALS, FINE POORLY GRADED GRAVEL, SUBROUNDED	SW/GP		D	40	55	5	COMPOSITE CUTTINGS SAMPLE PID=0.0ppm
153											
154											
155											DUST = 0.9 mg/m3 SOUND = 89 dB LEL = 0%
156											
157											
158											
159											
160–162	↓	↓	NA	SANDY GRAVEL: FINE GRAVELS POORLY GRADED ROUNDED-SUBANGULAR, QUARTZITE & VOLCANIC LITHIC FRAGMENTS, SAND IS COARSE POORLY GRADED, 10YR7/4 V.Y PALE BROWN	GP		D	60	35	5	COMPOSITE CUTTINGS SAMPLE
163											
164–165	↓		25 50/2 REF	ZERO RECOVERY - QUARTZITE COBBLE STUCK IN BOTTOM OF SHOE, SOME SAND, VOLCANIC LITHIC FRAGMENTS & QUARTZITE GRAVELS IN SAMPLER BUT PROB. SLOUGH.							NO RECOVERY
166											

DAMES & MOORE GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
166											
167											
168											
169											
170			NA	GRAVELLY SAND: FINE-COARSE SAND, WELL GRADED, SUBANGULAR, 7.5YR5/3, BROWN. GRAVELS ARE FINE, POORLY GRADED, ANGULAR, COMPOSED OF QUARTZITE (60%) MAFIC VOLCANIC CLASTS (40%).	SW GP		D	40	50	10	COMPOSITE CUTTINGS SAMPLE PID = 0.5 ppm
171											
172											
173											
174											DUST = 0.7 mg/m3 LEL = 0%
175											
176											
177											
178											
179											
180			NA	GRAVELLY SAND: AS ABOVE, SLIGHTLY HIGHER CLAY CONTENT	SW		D	30	55	15	COMPOSITE CUTTINGS SAMPLE PID = 0.3 ppm
181											
182											
183											

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GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (Include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample type, depth, tag number, or organic vapor measurements, etc.)
183											
184–185	↓	↓	50/5 REF	GRAVELLY SAND: AS ABOVE, FINE-COARSE, WELL GRADED, FINE-MED GRAVEL. POOR RECOVERY, ONLY IN SHOE OF SAMPLER	SW		D	20	75	5	PID = 0.0 ppm
186											
187											
188											
189											
190–192	↓	↓	NA	SANDY GRAVEL: FINE GRAVEL, POORLY GRADED, ANGULAR, SW IN PLACES, SAND IS FINE-COARSE, WELL GRADED, 10YR 7/3 V4 PALE BROWN	GP		D	70	25	5	COMPOSITE CUTTINGS SAMP = PID = 0.2 ppm
193											
194											DUST = 1.7 mg/m3 LEL = 0%
195											
196											
197											
198											
199											
200											

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SWMU No. 10/11 | Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
200–202			NA	GRAVELLY SAND: COARSE-MED, POORLY GRADED, ANGULAR-SUBROUNDED, 10YR6/3, PALE BROWN, FINE GRAVELS, SUBROUNDED, POORLY GRADED	SP		D	30	65	5	COMPOSITE CUTTINGS SAMPLE PID = 0.7 ppm
204–205			50/2 REF	ESSENTIALLY ZERO RECOVERY – MAFIC VOLCANIC COBBLE IN SHOE, BLOCKED SAMPLE AS ABOVE							ZERO RECOVERY
206											DUST = 1.8 mg/m³ LEL = 0%
210–212			NA	GRAVELLY SAND: FINE-COARSE, WELL GRADED SUBANGULAR, PALE BROWN, FINE GRAVELS, POORLY GRADED	SW		D	35	60	5	COMPOSITE CUTTINGS SAMPLE

Depth scale: 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217

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LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (Include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample typ depth, tag number, o. organic vapor measurements, etc.)
217											
218											
219											
220–222	↓	↓	NA	GRAVELLY SAND: FINE-COARSE SAND, PREDOM. COARSE SIZE, POORLY GRADED, ANGULAR 7.5YR4/3, BROWN. GP IN PLACES, FINE GRAVEL POORLY GRADED, ANGULAR	SP/GP		D	45	50	5	COMPOSITE CUTTINGS SAMPLE PID = 0.5 ppm
223											
223.5–225	↓	↓	50/4 REF	GRAVELLY SAND: FINE-COARSE, AS ABOVE, BUT POORLY GRADED, PREDOM. COARSE SAND. FINE POORLY GRADED GRAVELS, ANGULAR	SP/GP		D	45	50	5	PID = 0.5 ppm
226											DUST = 2.1 mg/m3 LEL = 8%
227											
228											
229											
230–232	↓	↓	NA	SANDY GRAVEL: FINE GRAVEL (1/4"-3/4") ANGULAR QUARTZITE (50%) MAFIC VOLCANIC CLASTS (50%) SAND: SP IN INTERVALS, FINE-COARSE BUT PREDOM COARSE SAND, POORLY GRADED, ANGULAR, 5YR4/3, LIGHT REDDISH BROWN.	GP		D	55	40	5	PID = 1.3 ppm COMPOSITE CUTTINGS SAMPLE
233–234				SEE DESCRIPTION ON R1S							

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DAMES & MOORE GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Estimate % of Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
233–239											DUST = 0.0 mg/m3 LEL = 0%
240–242	↓	↓	NA	GRAVELLY SAND: FINE-MED SAND, PREDOM MED SIZE, POORLY GRADED, 7.5YR6/3, LIGHT BROWN, SUBANGULAR, FINE GRAVEL PRESENT, GP INTERVALS.	SP		M	25	70	5	COMPOSITE CUTTINGS SAMPLE PID=6.7 ppm
242–246											
246–251	↓	↓	NA	ATTEMPTED CORE - INTERVAL 246-251 ft ZERO RECOVERY, CORE PROBABLY WASHED OUT.	ZERO RECOVERY						

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DAMES & MOORE

GROUP

LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth (ft)	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample typ depth, tag number, o organic vapor measurements, etc.)
250				CORE RUN - NO RECOVERY							
252			NA	SANDY GRAVEL: FINE GRAVEL POORLY GRADED, ANGULAR-SUBROUNDED. SP INTERVALS, COARSE SAND, POORLY GRADED, 5YR5/3 REDDISH BROWN, ANGULAR-SUBROUNDED	GP		W	60	35	5	COMPOSITE CUTTINGS SAMPLE PID = 5.7 ppm
255			NA	SAND: FINE-MED, PREDOM. MED SIZE, POORLY GRADED, 5YR5/3, REDDISH BROWN.	SP		W	5	80	15	COMPOSITE CUTTINGS SAMPLE PID = 4.7 ppm
257											DUST = 1.6 mg. LEL = 0%
260			NA	GRAVELS: FINE, POORLY GRADED, ANGULAR, QUARTZITE & MAFIC VOLCANIC CLASTS. SAND: MED, POORLY GRADED, SUBROUNDED, 10YR7/3 VERY PALE BROWN. CLAY: VY PALE BROWN, SOFT, LOW-MED PLASTICITY, MED DRY STRENGTH	GC		W	55	25	20	COMPOSITE CUTTINGS SAMPLE PID = 6.3 ppm
265			50/2	CLAYEY GRAVEL, AS ABOVE, POOR RECOVERY	GC		W	55	20	25	PID = 5.2 ppm

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LITHOLOGY LOG (continued)

SWMU No. 10/11

Site ID N-146-97

Depth	Interval	% Recovery	Blow Counts	Description (include in order lithology, grain size, sorting, angularity, Munsell color name & notation, mineralogy (structure, density, consistency, etc. as applicable)	USCS Symbol	Lithology	Water Content	Gr	Sa	Fi	Remarks (Include all sample types & depth, tag number, odor, organic vapor measurements, etc.)
267											
268–270			NA	SAND: FINE-COARSE POORLY GRADED, PREDOM. MED SIZE SAND, SUBANGULAR, 10YR 6/3, PALE BROWN	SP		W	-	90	10	COMPOSITE CUTTINGS SAMPLE PID = 5.2 ppm
270–272			NA	SAND: AS ABOVE, POORLY GRADED, PREDOM COARSE SAND, ANGULAR, QUARTZOSE & VOLCANIC LITHIC FRAGMENTS	SP		W	-	90	10	COMPOSITE CUTTINGS SAMPLE PID = 4.6 ppm

Depth scale: 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284

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APPENDIX E

Additional Soil Sampling Activities
SWMU 10

CONTENTS

CONTENTS (cont'd)

FIGURES

TABLES

Additional Data Collection Activities
SWMU 10

E.1 INTRODUCTION

This appendix presents the results of additional soil sampling activities at the Trinitrotoluene (TNT) Washout Facility (SWMU 10), Tooele Army Depot (TEAD), Tooele, Utah (Figure E-1). The field and laboratory work was performed in accordance with the *Final Soil Sampling Work Plan, TNT Washout Facility – SWMU 10* (URS-Dames & Moore, 2002).

E.1.1 BACKGROUND

Previous soil sampling activities at SWMU 10 identified explosives at elevated concentrations in and around several of the former washout ponds. The Phase II RFI Known Releases SWMUs Report presents the pre-Phase II and Phase II soil sample results (Rust E&I, 1995) and the Additional Field Investigation Report (URS-Dames & Moore, 2001) presents the results of soil samples collected in 1997.

The Known Releases SWMUs Corrective Measure Study (CMS) Work Plan (Dames & Moore, 2000) identified contaminants of concern (COCs) by comparing the maximum concentration of each COPC identified in the Phase II RFI to its respective quantitative corrective action objectives (CAO). Based on this evaluation, 2,4,6-TNT and cyclotrimethylenetrinitramine (RDX) are the COCs for surface soil and subsurface soil at SWMU 10. As shown in Figure E-2, these investigations detected explosives above CAOs from the liner to 5 feet bgs.

E.1.2 PURPOSE AND SCOPE

The purpose of this field investigation is to supplement existing data by further evaluating the areal extent of explosives contamination in soil above quantitative CAOs in and around the former TNT washout ponds. The goal of the field investigation was to collect additional data to complete the CMS Report. The results of the investigation are documented and evaluated in this appendix. Because additional sampling for SWMU 10 was recommended by the Army and regulatory agencies after the CMS Work Plan was finalized, information from this evaluation is included in this CMS Report.

Because this sampling event simply provides additional data for two contaminants which are already listed as site COCs, the additional data results are unlikely to significantly alter the results of the human health risk assessment (RA). Therefore, the RAs developed in the RFI are not revised. Likewise, the data collected as part of this field program are not used to supplement the Site-Wide Ecological RA (SWERA; Rust E&I, 1997b). The results of the additional field investigation support the CMS recommendations for SWMU 10 regarding the need for management measures or treatment technologies.

E.1.3 DATA GAPS

The treatment and disposal costs for each corrective action alternative in the CMS Report are highly sensitive to the volume of contaminated soil. Previous to this investigation, the uncertainties in the volume of contaminated soil requiring removal preclude selection of the ideal corrective measures alternative for SWMU 10. The objective of this supplemental soil investigation was to refine the horizontal and vertical extent of explosives contamination in shallow soils in and around the former ponds so that an estimate of treatment costs can be developed. The CMS Report evaluates the cleanup alternatives based on the improved soil volume estimate presented in this appendix.

E.1.4 ORGANIZATION

This appendix is organized as follows:

- Procedures used to conduct field activities (Section E.2).
- Sampling and chemical results for SWMU 10 (Section E.3).
- References (Section E.4).
- Soil boring logs, chains of custody, chemical data, data quality assessment, and field screening vs. EPA Method 8330 correlation analysis, respectively (Attachments A through E).

E.2 FIELD METHODS

E.2.1 SAMPLE COLLECTION STRATEGY

To evaluate soil contamination over a large area in an expedient and cost-effective manner, a three step sampling program was devised and samples were analyzed in the field for TNT and RDX using EPA-approved field assays. The sampling program was developed to minimize the number of samples needed to achieve the investigation's objective, while providing a sufficient number of samples to adequately characterize the volume of contaminated soil in the pond areas.

A 220 feet by 460 feet area covering the area of contamination was divided into sample grid blocks, each 20 feet square. The sampling steps followed a simple protocol: if RDX or TNT concentrations were above action levels in a sample grid-block, the

LEGEND:

(10) TNT WASHOUT FACILITY

FIGURE E-1
LOCATION OF SWMU 10
TOOELE ARMY DEPOT

URS
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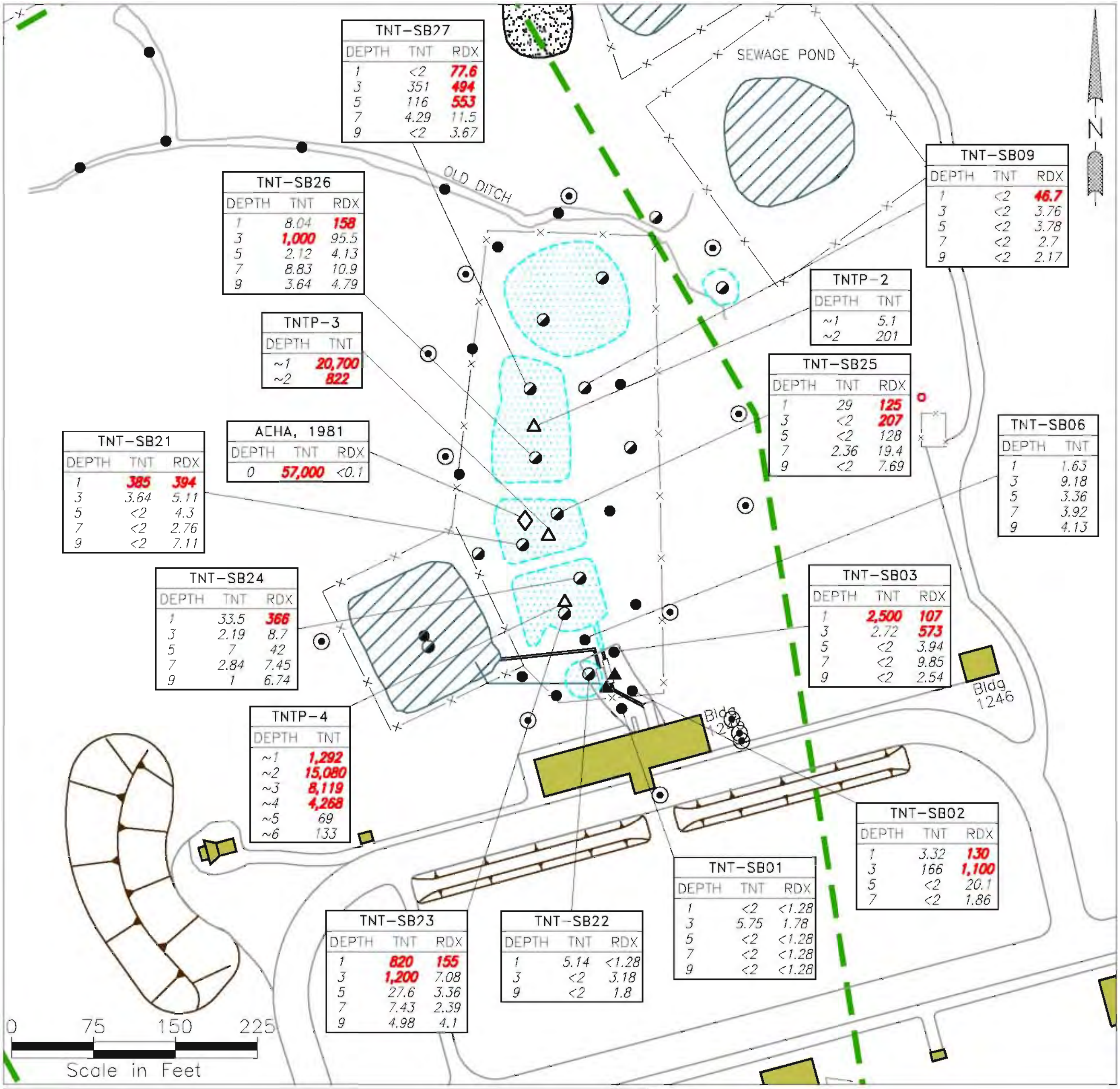


LEGEND

- SURFACE SOIL, AEHA, 1981
- 5 ft. BORING, PA/SI, 1988
- 10 ft. BORING, RFI, 1995
- 60 ft. BORING, RFI, 1995
- SURFACE WATER SAMPLE LOCATION
- 60 ft. BORING, CMS 1997
- FENCE
- BUILDING
- EXISTING POND
- FORMER POND
- SWMU BOUNDARY (APPROX.)

SAMPLE RESULT DEPTHS IN FEET BGS

RESULTS REPORTED IN ug/g

DETECTIONS ABOVE SURFACE AND SUBSURFACE CAOs ARE SHOWN IN RED.

SOURCE: RUST E&I, 1995

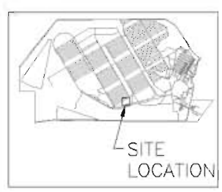


FIGURE E-2
TNT AND RDX CONCENTRATION IN SOIL TO 10 FEET BGS, PREVIOUS INVESTIGATIONS
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

URS
Dames & Moore

diagonally adjacent grid-block was sampled in the next step. Surface soil CAOs were used as the action levels for the sample collection activities. The surface soil CAOs for RDX and 2,4,6-TNT are 31 Φg/g and 86 Φg/g, respectively. In the first step, soil samples were collected from pre-determined sampling locations. In determining sample locations, first-step sample locations were placed on grid blocks primarily within the interior and perimeter portions of the former ponds. In selecting first-step sample locations, consideration was given to prior soil sample locations and analytical results. (Grids with prior sample results were not resampled.)

If results for all three sampled depths from a first-step boring indicated neither TNT nor RDX above their action levels, no adjacent second-step samples were collected radiating from that point on the grid. If any of the three soil samples collected from a first-step boring contained explosives at concentrations exceeding action levels, up to four second-step soil borings were sampled: one boring in each diagonally adjacent grid block. Three soil samples were collected at the same depths as the first-step boring. Second-step soil boring locations were placed by moving one grid-block diagonally in each direction away from the location of a first-step boring with exceedances.

Likewise, if all three samples from a second-step boring contained no explosives above the action level, no adjacent samples were collected radiating from that point on the grid. If a second-step boring contained explosives at concentrations exceeding action levels, third-step borings were sampled one grid-block diagonally away from the second-step exceedance. Three soil samples were collected at the same depths as for the second-step borings.

E.2.2 FIELD INVESTIGATION AND PROCEDURES

Table E-1 summarizes the field program. All work was performed in accordance with the Soil Sampling Work Plan.

A total of 54 soil borings were advanced to 7 feet bgs (or below the liner). Figure E-3 presents the location of the 54 soil borings. This included 30 first step borings, 12 second step borings, 9 third step borings, and 3 fourth step borings. The 3 fourth step borings were necessary because two third step borings exceeded action levels. Sampling for the fourth step borings following the procedures as for the first three steps.

At each boring location, surface fill was cleared away with a shovel or trowel and the depth to the underlying plastic liner, if present, was measured. Soil borings were drilled and sampled using a Model 5400 truck-mounted geoprobe. The desired sample depth was reached by advancing the geoprobe, then collecting the sample using a 2-inch-outside-diameter, 48-inch-long, macro bore sampler fitted with a non-reactive plastic liner. Attachment A includes the soil boring logs with borehole information, soil description, boring depth, and sample depths. After the sampler was driven to the desired sample interval, it was pulled from the borehole and carefully opened on a clean surface.

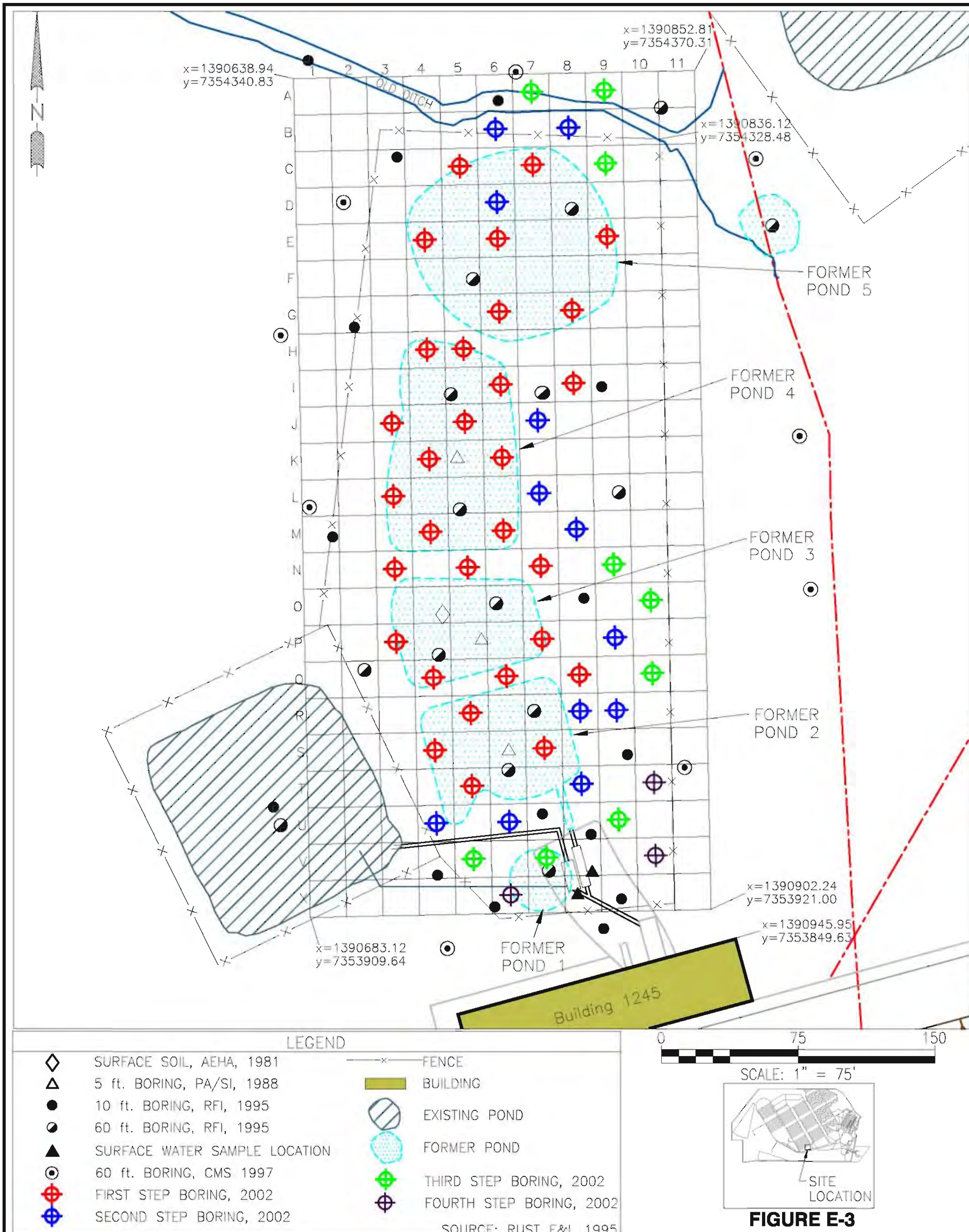
TABLE E-1

Summary of Field Program
TNT Washout Facility, SWMU 10

Step	Environmental Samples – Soil Borings: No. of Borings	Environmental Samples – Soil Borings: No. of Samples/ Boring	Environmental Samples – Soil Borings: Sample Depth Below Liner or Surface (ft)	Environmental Samples – Soil Borings: No. of Analyzed Soil Samples	Field QC Samples: Soil Duplicates (a)	Field QC Samples: MS/MSDs (b)	Field QC Samples: Equipment Rinse Blanks (c)	Total Soil Samples	Total Water Samples	Analytical Parameters
First										
Field Analysis	30	3	0, 3, 6	90	9			99		TNT, RDX
Off-site Analysis (10% of field analysis)				9	1	2	1	12	1	Explosives
Second										
Field Analysis	12	3	0, 3, 6	36	4			40		TNT, RDX
Off-site Analysis (10% of field analysis)				4	1	2	1	7	1	Explosives
Third										
Field Analysis	9	3	0, 3, 6	27	3			30		TNT, RDX
Off-site Analysis (10% of field analysis)				3			1	3	1	Explosives
Fourth										
Field Analysis	3	3	0, 3, 6	9	1			10		TNT, RDX
Off-site Analysis (10% of field analysis)				1				1		Explosives
Field Analysis Total:	**54**			**162**	**17**			**179**		TNT, RDX
Off-site Analysis Total:				**17**	**2**	**4**	**3**	**23**	**3**	Explosives

Other Field QC Samples	**No. of Samples**	**Analytical Parameters**
Source water	1	Explosives
Waste Handling Samples		
Decontamination water	1	Explosives, Ignitability, pH, Reactive Sulfide, and Reactive Cyanide
Field lab solid waste	1	Explosives, Ignitability, pH, Reactive Sulfide, and Reactive Cyanide
Field lab aqueous waste	1	Explosives, Ignitability, pH, Reactive Sulfide, and Reactive Cyanide

(a) Soil sample duplicates were collected at one per 10 samples analyzed in the field. Soil sample duplicates were also collected at one per 10 samples analyzed at DataChem Laboratory.
(b) Matrix spike/matrix spike duplicates (MS/MSDs) were collected at one per 10 samples analyzed at DataChem Laboratory.
(c) One equipment rinse blank was collected per step (excluding fourth step) and analyzed at DataChem Laboratory.



GPS (x,y) coordinates are in Utah Central State Plain, feet. (NAD 1983)
x = easting y = northing

FIGURE E-3
SOIL BORING LOCATIONS
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

URS Dames & Moore

P:\Bethesda\U000000572 USACE\89-F1000162.00-Tooele\SWMU10\FigE-3.dwg, Layout1, 3/3/2003 12:09:18 PM, sokhons, \\bTH1\BTH07J, 1:1

The soil was logged by the geologist before filling each sample container for chemical analyses.

Soil samples were collected from depths of 0- to 1-foot below the plastic liner, 3- to 4-feet below the plastic liner, and 6- to 7-feet below the plastic liner. The 0- to 1-foot and 3- to 4-feet depth intervals ("A" and "B" intervals) were collected from the first 48-inch core. The 6- to 7-feet depth interval ("C" interval) was collected from the second 36-inch core. The liner was patched and covered with soil to the existing grade. The liner was patched by placing 10 mil thick plastic sheets above and below the liner and sealing with silicone adhesive (as requested after the final work plan was issued) and tape. Both sheets had 6 inches of overlap beyond the liner hole. The bottom patch was taped to the liner along the perimeter of the hole. The top patch extended beyond the seal of the lower patch, and was taped to the liner along its perimeter. The top patch serves to protect the bottom patch, providing a double seal. A total of 22 borings were advanced within the liner. The depth from the ground surface to the liner varied between 2 inches and 16 inches. The borings logs in Attachment A present more detail on the liner.

In areas believed to have no liner, surface soils were cleared away at a "preview" location up to 2 feet bgs to verify that no liner was present. That soil was returned to the hole, and a sample boring was drilled within 1 foot of the preview location. Soil samples were collected from 0 to 1 foot, 3 to 4 feet, and 6 to 7 feet below ground surface from the boring.

All samples were analyzed in a field laboratory, as described in Section E.2.8. A total of 179 soil samples were collected including 17 duplicates. In addition, every tenth sample was split and sent to DataChem Laboratory for explosives analysis. A total of 21 soil samples were sent to DataChem Laboratory including two duplicates and two matrix spike/matrix spike duplicates (MS/MSDs).

E.2.3 SAMPLE IDENTIFICATION

The sample identification scheme presented in the Soil Sampling Work Plan was developed to easily correlate the sample result to its gird location. Table E-2 lists the sample IDs. Attachment B presents the Chains of Custody for the samples sent off-site to DataChem.

Each sample was assigned a unique code number that identifies its collection location. The first character identified the sample as collected during the first, second, third, or fourth step (i.e., 1, 2, or 3). The second and third character related the sample ID to the grid location as identified on Figure E-3. The second character indicated the sample grid row (i.e., A through X). The third character indicated the sample grid column (i.e., 1 through 11). The fourth character identified the sampling interval from which the sample was collected. The following letter characters were used to indicate sampling depth intervals:

TABLE E-2

Summary of Sample Identification
TNT Washout Facility, SWMU 10

Sample Type	No. of Samples	Sample ID No. (a)			Sample Depth Code (ft bgs or ft below liner)
Field Analysis	162	3A7A, B, C	1J5A, B, C	1Q6A, B, C	A = 0 to 1
		3A9A, B, C	2J7A, B, C	1Q8A, B, C	B = 3 to 4
		2B6A, B, C	1K4A, B, C	3Q10A, B, C	C = 6 to 7
		2B8A, B, C	1K6A, B, C	1R5A, B, C	
		1C5A, B, C	1L3A, B, C	2R8A, B, C	
		1C7A, B, C	2L7A, B, C	2R9A, B, C	
		3C9A, B, C	1M4A, B, C	1S4A, B, C	
		2D6A, B, C	1M6A, B, C	1S7A, B, C	
		1E4A, B, C	2M8A, B, C	1T5A. B. C	
		1E6A, B, C	1N3A, B, C	2T8A, B, C	
		1E9A, B, C	1N5A, B, C	4T10A, B, C	
		1G6A, B, C	1N7A, B, C	2U4A, B, C	
		1G8A, B, C	3N9A, B, C	2U6A, B, C	
		1H4A, B, C	3O10A, B, C	2U9A, B, C	
		1H5A, B, C	1P3A, B, C	3V5A, B, C	
		1I6A, B, C	1P7A, B, C	3V7A, B, C	
		1I8A, B, C	2P9A, B, C	4V10A, B, C	
		1J3A, B, C	1Q4A, B, C	4X6A, B, C	
Field Analysis Duplicates	17	3A9A FD	1N7C FD	2T8C FD	
		1E6C FD	3O10B FD	2U4B FD	
		1H4B FD	1P3C FD	3V7B FD	
		1H5C FD	2R8A FD	4X6B FD	
		1I8C FD	1S7C FD		
		2J7B FD	1T5C FD		
		1K6C FD			
Off-site Analysis (DataChem)	26	3A9ALA	1K6CLA	1T5CLA	
		1E6BMS	2L7BMS	2T8CLA	
		1EBMSD	2L7BMD	2T8CLD	
		1E6CLA	3O10BLA	2U4BLA	
		1H4BLA	1N7CLA	3V7BLA	
		1H5CLA	1P3CLA	4XBLA	
		1I8CLA	2R8ALA	1EB	
		2J7BLA	1S7CLA	2EB	
		SOURCE1	1S7CLD	3EB	

(a) Field QC samples have the same sample ID numbers as associated field samples, plus the following suffixes:
“FD” corresponds to a field analysis duplicate.
“LA” corresponds to a DataChem Laboratory analysis sample.
“LD” corresponds to DataChem Laboratory analysis duplicate sample.
“MS” corresponds to a matrix spike.
“MD” corresponds to a matrix spike duplicate.
“EB” corresponds to equipment rinse blank.

A = 0 to 1 feet below liner (or bgs)
B = 3 to 4 feet below liner (or bgs)
C = 6 to 7 feet below liner (or bgs)

The last two characters were reserved for field QC sample designations. Field QC samples had the same sample ID numbers as the field sample they were associated with plus the suffixes noted on Table E-2.

E.2.4 SAMPLE HANDLING, STORAGE, AND SHIPPING

Solid and liquid samples were filled with minimal headspace. Acid preservation was not required for any of the samples. All samples were packed on ice immediately after collection. Samples to be analyzed in the field laboratory were handed directly to the field lab chemists from the field geologist. The samples were then logged in and appropriately stored and placed on ice prior to analysis. The field laboratory resided in a secure building space located in the Base Realignment and Closure (BRAC) parcel.

E.2.5 LAND AND UTILITY SURVEYS

Prior to sampling at SWMU 10, sample locations were cleared for underground utilities by TEAD personnel, and excavation permits were obtained. During mobilization activities, the outline of the base grid was established. The base grid contained all of the 20-foot square grids from which a first, second, or third step boring could potentially have been drilled. Each boring was generally located in the center of the grid. As shown on Figure E-3, the total size of the base grid was 220 ft by 440 ft. Wooden stakes were placed at the four corners of the base grid; pin flags were placed every 20 feet along the exterior lines to establish grid lines. The four corner stakes, the northeast corner of Building 1245, and the northeast corner of the fence surrounding the former washout ponds were surveyed by global positioning system (GPS) to approximately ± 1 meter and noted in the field book. These coordinates are presented on Figure E-3. Because the former ponds and fence shown on Figure E-3 are not based on surveyed points, the area of contamination discussed in Section E.3 should be recreated in the field based on the GPS data. No elevation measurements were included in the survey.

E.2.6 DECONTAMINATION PROCEDURES

The geoprobe driller provided water for field cleaning. A sample of the water was analyzed for explosives prior to the start of the field activities. Analytical results for the decontamination source water were all non-detect. The chemical data results are included in Attachment C. All equipment was cleaned before work and after completion of all sampling activities. All drilling equipment in direct contact with soil (e.g., probe, samplers, tools) was washed and rinsed following completion of each borehole. Small sampling equipment and supplies was brushed and washed on-site in decontamination pans.

E.2.7 WASTE HANDLING

The following waste streams were containerized and disposed of:

- Decontamination water was containerized in one U.S. Department of Transportation (DOT)-approved 55-gallon drum.
- Field laboratory solid waste including sample soil, plastic, and glass were containerized in one 55-gallon drum. This waste stream also contained small amounts of zinc, acetone, and acetic acid.
- Field laboratory aqueous waste including soil sample extract, acetone, and acetic acid was stored in one 5-gallon metal solvent waste can.
- Field sampling equipment including plastic macro bore sample liners, plastic, and gloves were containerized in one 55-gallon drum.
- Miscellaneous lab wastes including used test kits, syringes, plastic, gloves, paper, acetone, acetic acid, residual soil from samples, and buckets were containerized in two 55-gallon drums.

Materials in each waste stream were containerized separately in properly labeled containers and placed at the 90-day storage yard. One composite sample was taken from each of the first three waste steams. Each sample was analyzed for explosives, ignitability, corrosivity (pH), and reactivity. The last two waste streams were characterized using generator knowledge. URS coordinated with the waste disposal firm (Safety-Kleen) and TEAD to have the waste handled and disposed of as hazardous waste due to the acetone, acetic acid and explosives-contaminated soil. The decontamination water was disposed of by Safety-Kleen as a non-hazardous waste.

Non-hazardous material that did not contact soil or solvents (i.e., coolers, cardboard) was disposed at the Tooele County Landfill.

E.2.8 ANALYTICAL METHODS

Field Laboratory Data

Each soil sample was analyzed using field assay testing kits, EPA SW-846 Method 8515 for TNT and Method 8510 for RDX. Table E-1 presents the total number of samples analyzed. Soil sample analyses for TNT and RDX were conducted as detailed in the User's Guides for TNT and RDX EnSys® Soil Test System. Both user's guides were developed by Strategic Diagnostics Inc. (SDI) and are presented in the Soil Sampling Work Plan. Method detection limits are below the quantitative CAOs identified in the Known Releases CMS Work Plan (Dames & Moore, 2000). The nominal method detection limit for TNT is 0.7 µg/g, which has a CAO of 86 µg/g; the nominal detection limit for RDX is 0.8 µg/g, which has a CAO of 31 µg/g. The upper concentration limit for both test methods is 30 µg/g, without dilutions. The relative standard deviation is 8 percent and 10 percent for TNT and RDX. For sample concentrations greater than 30 µg/g the sample extract was diluted with acetone and reanalyzed. Attachment D includes a detailed discussion regarding samples that were diluted and reanalyzed. The field laboratory was staffed by a manafacturer's trained URS analytical chemistry team and had demonstrated capability via precision and accuracy studies.

The colorimetric method is based on Beer's Law, in which the loss of light intensity (absorbance) is proportional to the sample concentration (the thickness of cuvet and intensity of the incident light are constant). A control sample with known concentration was analyzed with each batch of samples. The absorbance must be within the control limit before proceeding with sample analysis. An initial calibration was not required by this colorimetric method.

Off-site Laboratory (DataChem) Data

Ten percent of samples from each sample step were collected as splits and forwarded to a fixed-based, off-site analytical laboratory (DataChem Laboratories) for analysis of explosives by EPA SW-846 Method 8330.

Waste characterization samples were also analyzed by DataChem using the follow methods for soil and aqueous samples:

EPA Method SW8330 for residual explosives analysis
EPA Method SW1010 for ignitability
EPA Method SW846 Chapter 7.3 for reactivity
EPA Method 9040/9045 for corrosivity (pH)

Table E-1 presents the total number of samples analyzed, including field and laboratory QC samples.

E.2.9 CHEMICAL ANALYSIS RESULTS TABLES

Field laboratory data and off-site laboratory data were validated by URS using the methods discussed in Section E.2.11. These data are presented in the chemical analysis tables in Attachment C. This attachment begins with the field laboratory soil sampling results followed by the field laboratory QC results. Next is the field laboratory and QC dilutions tables. (Attachment D includes a detailed discussion regarding samples that were diluted and reanalyzed.) This is followed by the off-site laboratory soil sample split results and the off-site laboratory QC results.

Within the field laboratory result tables, if an analyte was not detected or detected below the reporting limit in a sample, it is marked "ND". Data validation flags, assigned by the URS peer reviewer, are found in the DV flags column. The reason code column corresponds to validation reason codes found at the beginning of Attachment C.

Within the off-site laboratory results tables, if an analyte was detected in a particular sample, the Measurement Boolean (MB) column is blank; if an analyte was not detected in a particular sample, the MB column is marked "ND". Laboratory flags were assigned by the laboratory to qualify the data. Ten percent of these results were validated by URS.

E.2.10 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Several field and laboratory QC samples were analyzed and evaluated. Table E-1 shows the types and number of samples collected. Analytical results are included in Attachment C. The results of the QC samples were used to assess the usability of the chemical data and to identify procedural problems.

The following field QC samples were used: field duplicates (QC replicates), QA splits (samples sent to DataChem), and field equipment blanks. Field duplicates and QA splits were each collected at a frequency of 10 percent. Field duplicates were collected for analysis by both the field laboratory and the off-site laboratory. Laboratory QC samples for the field test kits included method blanks, laboratory control spikes, and laboratory duplicates each analyzed at a frequency of one per batch. MS/MSD samples were required for the off-site laboratory and were collected at a frequency of 10 percent.

Seventeen field duplicates were analyzed by the field laboratory. Twenty-one soil sample QA splits were analyzed by the off-site laboratory for explosives. The QA splits included two field duplicates and two MS/MSDs. The off-site laboratory also analyzed three field equipment blanks and one source water blank for explosives.

Analytical results for the source water blank and the third field equipment blank were non-detect. RDX was detected at 0.229 µg/L in the first field equipment blank and 2,4,6-TNT was detected at 0.0954 µg/L in the second. These very low levels of explosives do not affect the usability of the results reported.

E.2.11 DATA MANAGEMENT AND VALIDATION

Field laboratory data and off-site laboratory data was validated and utilized by URS using the methods discussed in this section.

Data management activities included importing, archiving, managing, and presenting data as required for purposes of the CMS Report. Relevant portions of the data were used for site assessment, incorporation into maps and other graphics, and to present the data in tabular form. The off-site laboratory data were delivered in a Level III data package as a hard copy with an electronic data deliverable. Data were validated and entered into spreadsheets for this report. The data manager created the spreadsheet-based data entry form that was used by the field laboratory. All entries into the spreadsheet database were verified against hard copy information to ensure their integrity and completeness.

URS peer reviewed analytical data provided by both the field and project laboratory. This data was validated according to principles defined in the EPA National Functional Guidelines for Data Review modified to reflect the specifics of the analytical methods employed, the provisions of the Work Plan, and the Tooele Army Depot's Chemical Data Quality Management Plan (CDQMP) (USACE, 1999).

Attachment D presents the overall data quality assessment. A discussion for field laboratory samples which were diluted and reanalyzed is presented first. This is followed by the validation results for the field laboratory data, and the validation results for the off-site laboratory data. All reported values qualified by URS display validation flags on the chemical analysis tables. Included is an assessment of the collected data in relationship to project DQOs.

Off-Site Laboratory (DataChem) Data

URS validated 10 percent of the off-site laboratory data (Method SW8330), the results of which are shown in Attachment D. The QC sample results indicated generally acceptable performance. No major anomalies were found and all data, as qualified, are useable for their intended purpose based on the data reviewed. Validation was accomplished to the equivalent of EPA Level III, which did not include verification of calculations or parameter identification criteria. Samples associated with waste disposal activities were not validated.

Field Laboratory Data

For screening data (Methods SW8515 and SW8510), an independent review of data packages was performed to ensure compliance with specified analytical, QC, and data reduction procedures; data reporting requirements; and required accuracy, precision, and completeness measures. The following items were reviewed to validate the data when applicable:

Sample custody documents;
QC data summaries;
Raw data related to identification and quantitation;
Calibration verification data; and,
Analytical results.

Data validation reports were prepared for each day of field analytical operations. Each report consists of a narrative summary of findings, copies of analytical results with data qualifying flags applied (as required), supporting documentation, and explanations of data qualifying flags.

Because the data are intended to be compared to regulatory standards for purposes of assessing compliance, formal numeric data quality objectives were established. The data must be suitable for use in assessing the nature and extent of environmental impacts; assessing the risks associated with any such impacts; and as inputs to engineering decisions and designs. The percent completeness for the field laboratory data was found to be acceptable at 100%.

Table E-3 presents the QC summary for the field test kit analysis including frequency and type of laboratory QC samples, QC anomalies, corrective actions, and anticipated impacts on use of the data.

E.2.12 COMPARISON OF FIELD TEST KITS AND METHOD 8330 DATA

Once data management and validation were completed, a bias assessment was performed by comparing the field screening results to those of the project laboratory results. The complete field screening vs. EPA Method 8330 correlation analysis is presented in Attachment E. The assessment includes a summation and narrative comparison of the basic statistical descriptors for the two data sets. The assessment shows that the decisions made based on the field test results are identical to those made on fixed laboratory results. In all cases, there was a decision match. Although, the field and fixed laboratory techniques measure TNT and RDX differently, they demonstrate a good correlation.

E.2.13 NATURE AND EXTENT OF CONTAMINATION

Analytical results for TNT and RDX are presented in Section E.3. The volume of soil with TNT and RDX contamination levels above the CAO is estimated using the field screening data and data from previous investigations. As discussed in Section E.2.5, because the former ponds have not been surveyed, the area of contamination should be recreated in the field based on the GPS data for the 2002 sampling grid. The resultant volume calculation is incorporated into the CMS Report cost estimates for corrective measures alternatives for SWMU 10.

For estimating the extent of contamination, surface soil CAOs were compared to data results from 0 to 2 feet below ground surface. This includes all of the interval “A” sampling results. Subsurface soil CAOs were compared to the interval “B” and “C” samples. Surface soil CAOs for 2,4,6-TNT and RDX are 86 Φg/g and 31 Φg/g, respectively. Subsurface soil CAOs for 2,4,6-TNT and RDX are 710 Φg/g and 200 Φg/g, respectively.

TABLE E-3

QC Summary for Field Laboratory Analyses
TNT Washout Facility, SWMU 10

Test Type	Frequency (1)	Criteria	QC Anomalies	Corrective Actions	Anticipated Impacts on Use of Data
Instrument Preparation	Daily	$absorbance_{background} < \pm 0.002$	None	N/A	None
Method Blank	Per batch	< RL	None	N/A	None
LCS	Per batch	TNT - absorbance must be between 0.239-0.319 (2) RDX – absorbance must be between 0.045-0.075 (2)	On 04/05/02, the LCS recoveries were greater than the upper control limit for RDX at 0.097 for batch A and at 0.080 for batch B.	No corrective action was taken at the time.	The associated field sample results were qualified "J" and may be biased high.
Laboratory Duplicate Analysis	Per batch	%RPD < 35%	None	N/A	None
Field Duplicate Analysis	10%	%RPD < 35%	On 4/8/02, the field duplicate pair for sample 2J7B grouped in batch B displayed an RPD of 53% between the reported results for RDX. On 4/11/02, the field duplicate pair for sample 3V7B displayed an RPD of 47% between the reported results for RDX.	No corrective action was taken.	The sample matrix may not be homogeneous or RDX may be found in clumps.

LCS – Laboratory Control Sample
RL – Reporting Limit
RPD – Relative Percent Difference

(1) Test kit analyses performed over 8 days. A total of 11 batches for TNT and 12 batches for RDX were run.
(2) Changing control limits (i.e., procedures, reasons, etc.) are discussed in the Field Laboratory Data Validation Reports (Attachment D).

E.3 SAMPLE RESULTS AND CONTAMINATION ASSESSMENT

E.3.1 SAMPLE RESULTS

The sampling grid includes the five former washout ponds extending north from Building 1245. For discussion purposes, the former washout ponds will be referred to as Ponds 1 through 5 starting from the southernmost pond located in the middle of sample grid rows V and X (see Figure E-3).

TNT was detected in 44 of the 54 soil borings and 90 of the 162 soil samples. RDX was detected in 26 of the 54 soil borings and 56 of the 162 soil samples. Table E-4 summarizes the soil sample results. Attachment C presents the complete analytical data results, and Attachment D presents the data validation reports.

TNT was detected above CAOs in four borings and four samples. RDX was detected above CAOs in 17 borings and 19 samples. In surface soil, TNT was detected above its CAO once while RDX was detected above its CAO 14 times. Figure E-4 presents TNT and RDX sample detections above their respective action levels. The maximum concentration of TNT detected was 7,430 µg/g in sample 1Q6B. The maximum concentration of RDX detected was 947 µg/g in sample 1Q8B. The results show an almost continuous area of contamination above action levels from Pond 1 to Pond 4. Pond 5 has two COC locations both located in the northern part of the pond. TNT and RDX concentrations were highest in the area between grid rows P and V and grid columns 6 and 9. This area had exceedences at all three depth intervals and corresponds to Ponds 2 and 3. Beyond this peak area, exceedances are limited to the surface soil.

E.3.2 SUMMARY OF PREVIOUS SAMPLE RESULTS

As discussed in Section E.1.1, previous investigations detected TNT and RDX above their respective CAOs at the former washout ponds. As shown on Figure E-2, the previous investigations found TNT and RDX concentrations to be highest in Ponds 3 and 4 from the liner to 4 feet bgs. TNT was detected in the surface soil of Pond 3 at 57,000 µg/g in 1981 and 20,700 µg/g in 1988 (Rust E&I, 1995). Soil sample results from the 1995 Phase II investigation detected maximum TNT and RDX soil concentrations of 15,080 µg/g and 1,100 µg/g (Rust E&I, 1995). These previous sample results for TNT or RDX were above action levels at 12 boring locations.

E.3.3 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of soil contamination is based on both the soil sample results discussed in Section E.3.1 and the previous investigation results summarized in Section E.3.2.

TABLE E-4
SUMMARY OF SOIL SAMPLE RESULTS
TNT WASHOUT FACILITY, SWMU 10

Sample Location	Sample ID	Liner Depth (in. bgs)	Sample Results in µg/g					
			Depth A (0-1 ft.)		**Depth B** (3-4 ft.)		**Depth C** (6-7 ft.)	
			TNT	**RDX**	**TNT**	**RDX**	**TNT**	**RDX**
			CAO Exceedance Levels (data above CAOs bold & shaded)					
			86	**31**	**710**	**200**	**710**	**200**
A7	3A7	-	ND	ND	ND	ND	ND	ND
A9	3A9	-	1.5	ND	ND	ND	ND	ND
B6	2B6	-	0.7	ND	ND	ND	ND	ND
B8	2B8	-	ND	**37**	ND	ND	ND	1.5
C5	1C5	-	ND	ND	ND	ND	0.9	ND
C7	1C7	-	5	**150**	ND	ND	ND	2.4
C9	3C9	-	1.4	ND	ND	ND	ND	ND
D6	2D6	-	ND	3.9	ND	ND	ND	ND
E4	1E4	-	ND	ND	ND	ND	ND	ND
E6	1E6	-	ND	ND	ND	ND	ND	ND
E9	1E9	-	1.3	13	ND	ND	0.8	ND
G6	1G6	-	ND	ND	ND	ND	ND	ND
G8	1G8	-	ND	ND	ND	ND	4.8	ND
H4	1H4	-	ND	ND	ND	ND	ND	ND
H5	1H5	-	ND	ND	ND	ND	ND	ND
I6	1I6	-	ND	ND	ND	ND	5.1	0.8
I8	1I8	-	ND	ND	ND	ND	5.2 (a)	ND
J3	1J3	-	ND	ND	ND	ND	ND	ND
J5	1J5	7	ND	ND	ND	ND	1.7	ND
J7	2J7	9	1.4	4.7	ND	5.7 (a)	1.4	21.3
K4	1K4	-	ND	ND	ND	ND	0.8	ND
K6	1K6	4	1.6	**48.6**	0.9	ND	2.2	ND
L3	1L3	-	ND	ND	ND	ND	3.4	ND
L7	2L7	5	1.5	13.9	16	28	4.7	ND
M4	1M4	-	ND	ND	ND	ND	2.4	ND
M6	1M6	4	0.9	15.6	6.7	1.1	5.1	ND
M8	2M8	9	2.5	**44.6**	0.9	2.8	2	ND
N3	1N3	-	1.6	ND	ND	ND	ND	ND
N5	1N5	10	ND	ND	1.6	ND	7.1	1.5 (a)
N7	1N7	7	2.4	**41.7**	253.9	1.5	5.2	1.3
N9	3N9	10	ND	ND	1.1	ND	1	ND
O10	3O10	-	0.8	ND	ND	ND	2.1	ND
P3	1P3	-	2	ND	ND	ND	2.0 (a)	ND
P7	1P7	6	2.3	23.9	665.6	5.4	**2987.6**	**392.1**
P9	2P9	6	2.6	22	3.7	**484.3**	4.1	1.4
Q4	1Q4	-	0.7	ND	1.4	ND	1.6	ND
Q6	1Q6	7	7.8	**128.9**	**7430.3**	14	28	**474.7**
Q8	1Q8	2	15.9	**127.8**	164.1	**946.6**	16.6	80.1
Q10	3Q10	-	ND	ND	ND	ND	1	ND
R5	1R5	11.5	1.6	**135.4**	ND	ND	1.9	ND
R8	2R8	3	**158.8**	**91.7**	4.2	31.3	4.1	1.2

TABLE E-4
SUMMARY OF SOIL SAMPLE RESULTS
TNT WASHOUT FACILITY, SWMU 10
(Continued)

Sample Location	Sample ID	Liner Depth (in. bgs)	Sample Results in µg/g					
			Depth A (0-1 ft.)		**Depth B** (3-4 ft.)		**Depth C** (6-7 ft.)	
			TNT	**RDX**	**TNT**	**RDX**	**TNT**	**RDX**
			CAO Exceedance Levels (data above CAOs bold & shaded)					
			86	**31**	**710**	**200**	**710**	**200**
R9	2R9	7	1.4	5.4	1.7	6	6.1	ND
S4	1S4	-	ND	ND	ND	ND	2.8	ND
S7	1S7	4	3.1	**50.3**	**1541.8**	4.2	99.1	1.4
T5	1T5	11	1.7	**62.9**	4.2	30.1	6.0 (a)	0.85
T8	2T8	9	8.2	**108.9**	12.2	ND	498.5 (a)	1.2
T10	4T10	-	ND	ND	1.2	ND	1.2	ND
U4	2U4	-	1.9	ND	ND	ND	3.1	ND
U6	2U6	16	75.5	**43.2**	108.4	1.2	22.1	ND
U9	2U9	7	21.1	**228.6**	7.3	1.9	5.2	2.5
V5	3V5	-	ND	ND	ND	ND	1.6	ND
V7	3V7	10	29.9	6.2	14.2	175.6	15.8	**216.4**
V10	4V10	-	1.4	6	ND	ND	0.7	ND
X6	4X6		ND	ND	ND	ND	ND	ND

(a) Corresponding field duplicate value

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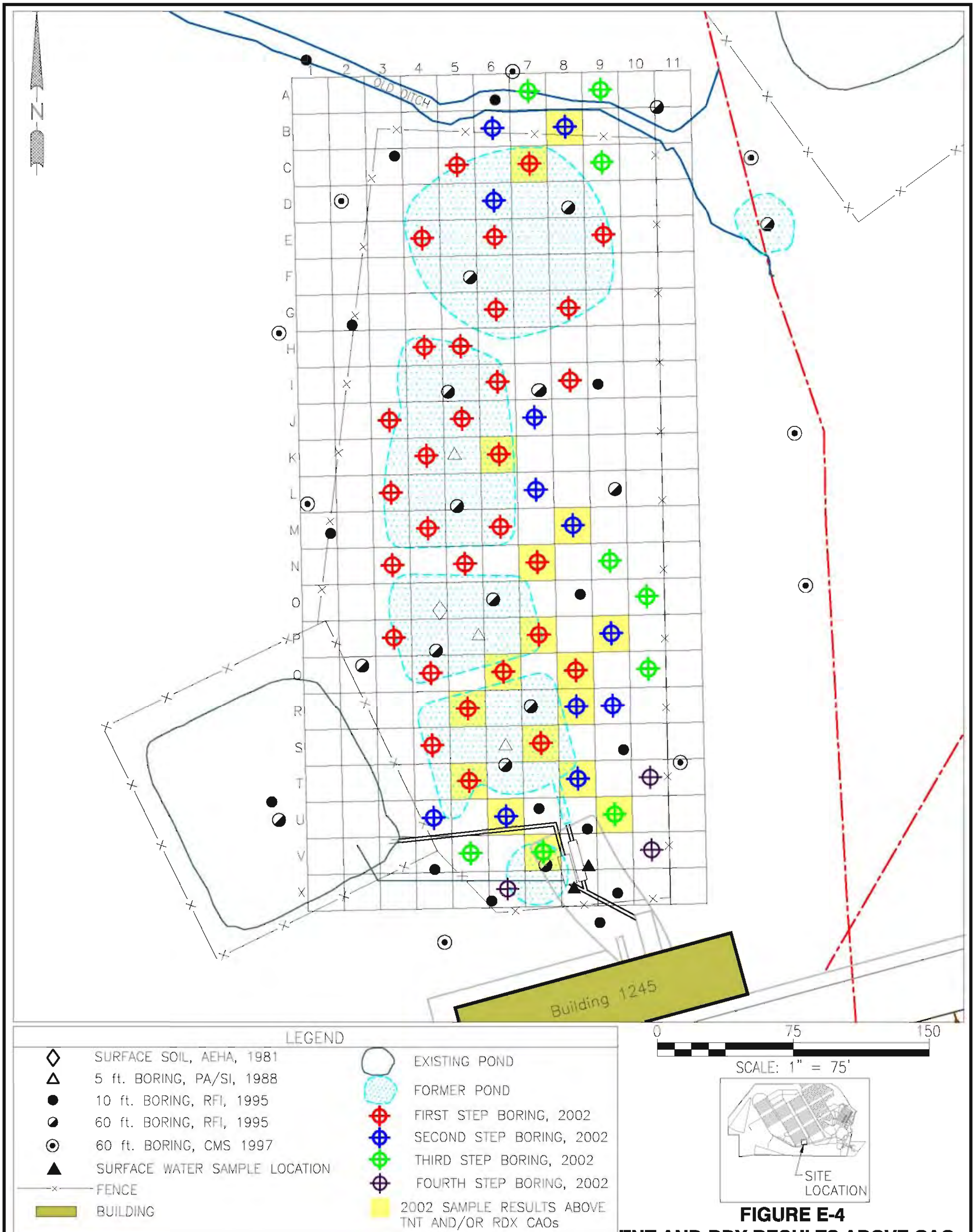


FIGURE E-4
TNT AND RDX RESULTS ABOVE CAOs
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

URS
Dames & Moore

The soil sample results show three areas of contamination above action levels. The largest area covers Ponds 1, 2, and 3. Ponds 2 and 3 contain the highest levels of TNT and RDX in each of the investigations. Most of this area contains contamination in the surface and subsurface soil. Three 2002 sample locations (P7, Q6, and V7) exceeded CAOs at 6 to 7 feet below the liner. However, it appears most of the subsurface contamination is less than 5 feet below the liner. Pond 4 contained several high detections of TNT and RDX from the liner to 5 feet below the liner. A hot spot of RDX was also found in the northern portion of Pond 5. The Pond 5 area of contamination appears to be limited to surface soil.

Sampling was continued until all areas of contamination were bounded by samples below action levels. The total area of contaminated soil above CAOs appears to be approximately 40 percent less than the estimated area presented in the Draft Known Releases CMS Report.

E.3.4 ESTIMATE OF CONTAMINATED VOLUME

Figure E-5 shows the previous COC locations and the additional soil sample COC locations. Based on these COC locations, the estimated area and volume of soil at SWMU 10 with concentrations of TNT and RDX above CAOs is 25,300 square feet (ft^2) and 5,000 cubic yards (yd^3) (see Figure E-5). This volume of contaminated soil is split between three separate areas. An area of approximately 18,700 ft^2 covers most of Ponds 1, 2, and 3. It is estimated that within this area, about 20 percent of the soil is contaminated to a depth of 9 feet bgs and the remaining 80 percent to a depth of 5 feet bgs. As a result, this area contains approximately 4,020 yd^3 of contaminated soil. An area of approximately 4,500 ft^2 covers a significant portion of Pond 4. The estimated depth of contaminated soil within this area is 5 feet bgs. This area contains approximately 830 yd^3 of contaminated soil. An area of approximately 2,100 ft^2 is located in the northern part of the Pond 5. The estimated depth of contaminated soil within this area is 2 feet bgs. This area contains approximately 155 yd^3 of contaminated soil.

E.3.5 CONCLUSIONS

The additional data soil sample results provide a refined estimate of the horizontal and vertical extent of explosives contamination in the shallow soils in and around the former ponds. The additional data confirms that former Ponds 3 and 4 contain the highest concentrations of TNT and RDX. The contamination within the former ponds is tightly bounded by additional samples which are below action levels.

E.4 REFERENCES

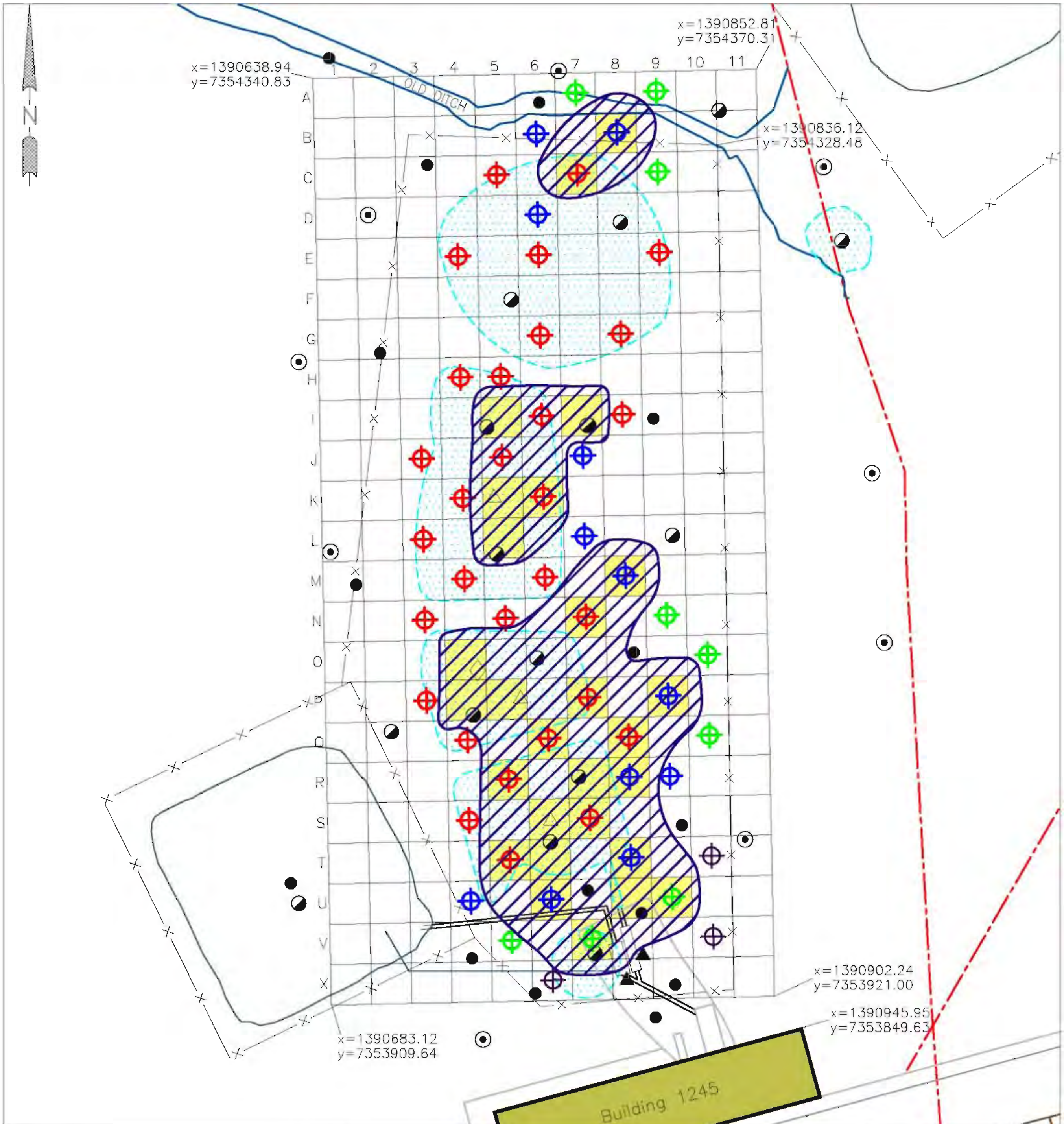
URS-Dames & Moore, 2001. *Final, Known Releases SWMUs, Tooele Army Depot, Tooele, Utah, Additional Field Investigation Report*, Contact No. DACA31-94-D-0060, prepared for Tooele Army Depot, Tooele, Utah, November 2001.

Dames & Moore, 2000. *Second Revised Final Planning Documents, Known Releases SWMUs, Tooele Army Depot, Tooele, Utah, Volume I: Corrective Measures Study Work Plan*, Contract No. DACA31-94-D-0060, prepared for Tooele Army Depot, Tooele, Utah, February 2000.

Rust E&I, 1995. *Tooele Army Depot - North Area, Revised Final RCRA Facility Investigation Report, Phase II, Study Known-Releases SWMUs*, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland.

USACE, 1999. *Chemical Data Quality Management Plan, Tooele Army Depot*, Final, Revision 2, June 1999.

P:\Bethesda\U000000572 USACE\89-F1000162.00-Tooele\SWMU10\FigE-5.dwg, Layout1, 3/3/2003 1:40:48 PM, sokhons, BTH07J.pc3, 1:1



LEGEND

- SURFACE SOIL, AEHA, 1981
- 5 ft. BORING, PA/SI, 1988
- 10 ft. BORING, RFI, 1995
- 60 ft. BORING, RFI, 1995
- 60 ft. BORING, CMS 1997
- SURFACE WATER SAMPLE LOCATION
- FENCE
- BUILDING
- SAMPLE RESULTS ABOVE TNT AND/OR RDX CAOs
- EXISTING POND
- FORMER POND
- FIRST STEP BORING, 2002
- SECOND STEP BORING, 2002
- THIRD STEP BORING, 2002
- FOURTH STEP BORING, 2002
- ESTIMATED AREA OF CONTAMINATION

SOURCE: RUST E&I, 1995

GPS (x,y) coordinates are in Utah Central State Plain, feet. (NAD 1983)
x = easting y = northing

URS
Dames & Moore

FIGURE E-5
APPROXIMATE AREA OF CONTAMINATION
TNT WASHOUT FACILITY (SWMU 10)
TOOELE ARMY DEPOT

ATTACHMENT A
Soil Boring Logs

LOCATION OF BORING	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
See Appendix E, Figure E-3 for Grid Layout	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. A7
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1105	1120
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/10/2002	4/10/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	
		3A7A	0		Brown to dark brown silty SAND, with organic matter, moist
			1	SM	
			2		
		3A7B	3	SW	Grades to light brown SAND, medium to fine grained, trace silt, moist
Macro Core	48 / 40		4		Grades to mottled greenish gray to gray & yellowish red to reddish brown SAND, medium to fine grained, trace silt, slightly moist
			5	SW	
		3A7C	6		SAME AS ABOVE, moisture decreases with depth
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS

BORING NO. **A9**

SHEET 1 OF 1

DRILLING	START	FINISH
TIME	1047	1102
DATE	4/10/2002	4/10/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	**SAMPLES COLLECTED**	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3A9A, 3A9AFD, 3A9ALA		SM	Brown to dark brown silty SAND, with organic matter, slightly moist
			1		
			2		
			3	SM	Grades to light brown silty SAND, moist
		3A9B			
Macro Core	48 / 42		4		
			5	SW	Grades to mottled greenish gray & yellowish red to reddish brown SAND, medium to fine trace silt, slightly moist; moisture decreases with depth
		3A9C	6		
Macro Core	36 / 36		7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
BORING NO.	B6
SHEET	1 OF 1
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS

DRILLING	START	FINISH
TIME	1000	1015
DATE	4/8/2002	4/8/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2B6A		SM	Dark brown silty SAND, moist
			1		
			2	SW	Grades to light brown SAND, medium to fine grained, slightly moist
			3		
		2B6B			
Macro Core	48 / 40		4	SW - SP	Mottled greenish gray to gray & yellowish red to reddish brown silty SAND, trace gravel, subrounded to rounded, slightly moist
			5		
			6	SW	Greenish gray to gray SAND, medium to fine grained, slightly moist
Macro Core	36 / 36	2B6C		SW - SP	Grades to mottled greenish gray to gray & yellowish red to reddish brown SAND, medium to fine grained, slightly moist, trace silt and rounded gravel grade in with increasing deptl
			7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	B8
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	1035	1050
DATE	4/8/2002	4/8/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2B8A		SM	Brown to dark brown silty SAND, with organic matter, moist
			1		
			2	SW	Grades to light brown SAND, medium to fine grained, moist
		2B8B	3		
Macro Core	48 / 43		4		
			5	SP - SM	Grades to greenish gray to gray & yellowish red to reddish brown silty SAND and gravel, subrounded to rounded, moist
		2B8C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. C5
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0850	0910
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1C5A		SW-SP	Yellowish red to brownish yellow SAND, medium-grained, dry
			1		
			2		
			3		
		1C5B			
Macro Core	48 / 36		4		
			5	SM	Greenish gray to gray silty SAND, dry
			6		
		1C5C		SM	Grades to mottled yellowish red to reddish brown & greenish gray silty SAND, dry
Macro Core	36 / 36		7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	C7
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley		

		DRILLING START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0917	0935
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1C7A			Yellowish red to reddish brown SAND, coarse to fine grained, dry
			1	SW - SP	
			2	SM	Brown silty SAND, slightly moist
		1C7B	3		Grades to gray silty SAND, slightly moist
Macro Core	48 / 36		4	SM	
			5		SAME AS ABOVE, silt increases with depth
		1C7C	6	SM	
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	**C9**
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	1005	1020
DATE	4/10/2002	4/10/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3C9A			Brown to dark brown silty SAND, with pebbles and gravel, subangular to subrounded, moist
			1	GM - SM	
			2		
			3		Grades to light brown silty SAND, moist
		3C9B			
Macro Core	48 / 37		4	SM	
			5		
			6		Grades to mottled greenish gray to gray & yellowish red to reddish brown SAND, medium to fine grained, trace silt, slightly moist; moisture decreases with depth
		3C9C		SW	
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. **D6**
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1130	1145
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/8/2002	4/8/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2D6A		SP - SM	Dark brown silty SAND and gravel, subangular to rounded, with organic matter, moist
			1		
			2	SM	Light brown silty SAND, moist
		2D6B	3		
Macro Core	48 / 40		4	SM	Grades to mottled greenish gray & yellowish red to reddish brown silty SAND, trace gravel rounded, moist; moisture decreases with depth
			5		
		2D6C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. E4
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0820	0830
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/7/1998	4/7/1998

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

**Original log lost. Log estimated based on field observations and nearby boring information.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1E4A			Light brown silty SAND, moist
			1		
			2	SM	
			3		
		1E4B			
Macro Core	48 / 40		4		Grades to mottled light brown to greenish gray & brownish yellow to yellowish red silty SAND, moist
			5	SM	
			6		
Macro Core	36 / 36	1E4C	7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING See Appendix D, Figure D-3 for Grid Layout	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. E6 SHEET 1 OF 1
	SAMPLING METHOD: Geoprobe 4' Macro Core		
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0940	0950
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade   ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	SURFACE CONDITIONS Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.
			0		
		1E6A		SW - SP	Yellowish red to brown SAND, medium to fine grained, dry
			1		
			2		
		1E6B, 1E6BMS, 1E6BMD	3		
Macro Core	48 / 40		4	SW - SM	Mottled reddish brown to yellowish red & gray SAND, medium to fine grained, dry
			5		
		1E6C, 1E6CFD, 1E6CLA	6	SM	Grades to silty SAND, dry
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	E9
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING	
WATER LEVEL	N/A	START TIME	FINISH TIME
TIME (W.L.)	N/A	1008	1020
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1E9A		SP	Yellowish red SAND, coarse to medium grained, with quartz gravel and pebbles, subangular to rounded, dry
			1		
			2		
		1E9B	3	SW - SP	Grades to light brown SAND, medium to fine grained, dry
Macro Core	48 / 40		4		
			5		
		1E9C	6	SM	Grades to gray silty SAND, dry
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING See Appendix D, Figure D-3 for Grid Layout	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. **G6**
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1028	1042
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	**SAMPLES COLLECTED**	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1G6A		SP	Reddish brown SAND, coarse to fine grained, with pebbles, slightly moist
			1		
			2		Grades to brown SAND, medium to fine grained, trace silt, slightly moist
			3	SP - SW	
Macro Core	48 / 42	**1G6B**	4		
			4		Light brown silty SAND, dry
			5	SM	
Macro Core	36 / 36	**1G6C**	6		
			7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
See Appendix D, Figure D-3 for Grid Layout	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. **H4**
			SHEET 1 OF 1
	SAMPLING METHOD: Geoprobe 4' Macro Core		
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0835	0845
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/7/1998	4/7/1998

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

**Original log lost. Log estimated based on field observations and nearby boring information.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	**SAMPLES COLLECTED**	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	
		1H4A	0		Brown to dark brown SAND, coarse to medium grained, and gravel, subangular to rounded, dry
			1	GP - SP	
			2		Brown to yellowish brown SAND, medium to fine grained, dry
		1H4B, 1H4BFD, 1H4BLA	3	SP - SW	
Macro Core	48 / 40		4		
			5		Greenish gray to gray SAND, medium to fine grained, dry
		1H4C	6	SW	
Macro Core	36 / 36		7		Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	BORING NO.
Direct Push (Geoprobe)	G8
	SHEET 1 OF 1
SAMPLING METHOD:	
Geoprobe 4' Macro Core	
DRILLING COMPANY & DRILLER:	DRILLING
EarthProbe, Shawn Bromley	START / FINISH

WATER LEVEL	N/A	TIME 1055	TIME 1105
TIME (W.L.)	N/A		
DATE (W.L.)	N/A	DATE 4/3/2002	DATE 4/3/2002
INSPECTOR	Dana Harris, URS		

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1G8A		SM	Brown to brownish yellow silty SAND, dry
			1		
			2		
		1G8B	3		
Macro Core	48 / 39		4		
			5	SM	Mottled gray & brownish yellow silty SAND, dry
		1G8C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. H5
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING
			START / FINISH
	WATER LEVEL	N/A	TIME 0745 / TIME 0805
	TIME (W.L.)	N/A	
	DATE (W.L.)	N/A	DATE 4/4/2002 / DATE 4/4/2002
DATUM Existing Grade; ELEVATION	INSPECTOR	Dana Harris, URS	

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1H5A		GP - SP	Brown to dark brown SAND, coarse to medium grained, and gravel, subangular to rounded, dry
			1		
			2		Brown to yellowish brown SAND, medium to fine grained, dry
			3		
		1H5B		SP - SW	
Macro Core	48 / 40		4		
			5		Greenish gray to gray SAND, medium to fine grained, dry
			6	SW	
		1H5C, 1H5CFD, 1H5CLA			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
See Appendix D, Figure D-3 for Grid Layout	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. **I6**
			SHEET 1 OF 1
	SAMPLING METHOD: Geoprobe 4' Macro Core		
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING
	WATER LEVEL	N/A	START TIME 0830 / FINISH TIME 0850
	TIME (W.L.)	N/A	
	DATE (W.L.)	N/A	START DATE 4/4/2002 / FINISH DATE 4/4/2002
DATUM Existing Grade / ELEVATION	INSPECTOR	Dana Harris, URS	

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1I6A		GP - SP	Brown to dark brown SAND, coarse to medium, and gravel, subangular to rounded, dry
			1		
			2		
		1I6B	3		
Macro Core	48 / 39		4		
			5	SP - SW	Grades to mottled yellowish red to reddish brown & greenish gray to gray SAND, medium to fine grained slightly moist
		1I6C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
See Appendix D, Figure D-3 for Grid Layout	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. I8
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING START / FINISH
	WATER LEVEL: N/A		TIME 0850 / TIME 0900
	TIME (W.L.): N/A		
	DATE (W.L.): N/A		DATE 4/4/2002 / DATE 4/4/2002
DATUM Existing Grade; ELEVATION	INSPECTOR: Dana Harris, URS		

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1I8A	1	SP	Dark brown SAND, coarse to medium grained, with some gravel, subrounded to rounded, slightly moist
			2	SP - SW	Brown to light brown SAND, medium to fine grained, slightly moist
		1I8B	3		
Macro Core	48 / 38		4	SP- SW	Mottled gray & reddish brown SAND, medium to fine grained, slightly moist
			5		
		1I8C, 1I8CFD, 1I8CLA	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	J3
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley		

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0900	0920
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/8/2002	4/8/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1J3A			Light brown silty SAND, moist
			1	SM	
			2		
			3		Grades to mottled light brown to greenish gray & brownish yellow silty SAND, moist
		1J3B			
Macro Core	48 / 40		4		
			5	SM	
					SAME AS ABOVE
			6		
		1J3C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS

BORING NO.	K4
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	0930	0946
DATE	4/4/2002	4/4/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1K4A		SP	Brown SAND, medium to fine grained, dry
			1		
			2	SP - SW	Mottled light brown & gray SAND, medium to fine grained, dry
			3		
		1K4B			
Macro Core	48 / 39		4		
			5	SP - SW	Mottled gray & yellowish red silty SAND, slightly moist
			6		
		1K4C			
Macro Core	36 / 36		7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. **L3**
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME 0920	TIME 0932
TIME (W.L.)	N/A		
DATE (W.L.)	N/A	DATE 4/8/2002	DATE 4/8/2002
INSPECTOR	Dana Harris, URS		

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1L3A			Light brown to brown silty SAND, moist
			1		
			2	SM	
			3		
		1L3B			
Macro Core	48 / 37		4		
			5		Grades to mottled greenish gray to gray & yellowish red to reddish brown silty SAND, moist
			6	SM	
		1L3C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. M4
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING
WATER LEVEL	N/A	START TIME 1040 / FINISH TIME 1050
TIME (W.L.)	N/A	
DATE (W.L.)	N/A	START DATE 4/4/2002 / FINISH DATE 4/4/2002
INSPECTOR	Dana Harris, URS	

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1M4A		SP - SM	Dark brown silty SAND, moist
			1		
			2	SP - SW	Greenish gray SAND, coarse to fine grained, moist
			3		
		1M4B		SW	Grades to gray SAND, medium to fine grained, dry
Macro Core	48 / 37		4		
			5		
				SW	Mottled gray to light brown & yellowish red to reddish brown SAND, medium to fine grained, slightly moist
		1M4C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
BORING NO.	N3
SHEET	1 OF 1
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS

DRILLING	START	FINISH
TIME	0940	0955
DATE	4/8/2002	4/8/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1N3A		SM	Dark brown silty SAND with organic matter, moist
			1	SM	SAME AS ABOVE, with wood chips
			2	SM	Light brown silty SAND, moist
		1N3B	3	SW	Light brown to greenish gray SAND, medium to fine grained, trace silt, slightly moist
Macro Core	48 / 40		4		
			5	SW	Grades to mottled light brown to greenish gray & yellowish red SAND, medium to fine grained, moist
		1N3C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. **O10**
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0910	0925
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/10/2002	4/10/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3O10A		SM	Light brown to yellowish red silty SAND, moist
			1		
			2		
			3		
		3O10B, 3O10BFD, 3O10BLA			
Macro Core	48 / 38		4		
			5		
			6	SP	Grades to greenish gray to gray SAND, medium to fine grained, with gravel and pebbles, subangular to subrounded, dry
		3O10C			
Macro Core	36 / 36		7	SP	SAME AS ABOVE, silt grades in, becomes moist
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	P3
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING	
		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1432	1448
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1P3A		SM	Yellowish red to brown silty SAND, dry
			1		
			2		
			3	SM - SW	Grades to gray to greenish gray SAND, medium to fine grained, trace silt, dry
		1P3B			
Macro Core	48 / 42		4		
			5		
			6		
Macro Core	36 / 36	1P3C, 1P3CFD, 1P3CLA			
			7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. **Q4**
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1540	1605
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1Q4A			Yellowish brown to brown SAND, coarse to medium grained, slightly mois
			1	SP - SW	
			2		Grades to yellowish brown to brown SAND, medium to fine grained, slightly moist
			3		
		1Q4B			
Macro Core	48 / 38		4	SW	
			5		
			6		
		1Q4C			
Macro Core	36 / 36		7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	**Q10**
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	0830	0845
DATE	4/10/2002	4/10/2002

DATUM Existing Grade ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3Q10A		SP	Light brown to yellowish red SAND, coarse to fine grained, trace silt, mois
			1		
			2		
			3		
		3Q10B		SW	Grades to mottled greenish gray & yellowish red SAND, medium to fine grained, dry
Macro Core	48 / 39		4		
			5		
			6	SW	Grades to mottled greenish gray to light brown & yellowish red SAND, medium to fine grained, trace silt, moist
		3Q10C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. S4
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1525	1545
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/4/2002	4/4/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1S4A	1	SM	Dark brown silty SAND, with organic matter, moist
			2	SM	Grades to light brown silty SAND, moist
		1S4B	3		
Macro Core	48 / 39		4	SW	Grades to light brown to greenish gray SAND, medium to fine grained, moist
			5		
		1S4C	6	SM	Grades to light brown silty SAND, slightly moist
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD: Direct Push (Geoprobe)

BORING NO. **T10**

SHEET 1 OF 1

SAMPLING METHOD: Geoprobe 4' Macro Core

DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1520	1535
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/10/2002	4/10/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		4T10A		GM - SM	Brown to light brown silty SAND with pebbles, subrounded to rounded, slightly moist
			1		
			2	SW	Mottled light brown to greenish gray & yellowish red SAND, medium to fine grained, trace silt, slightly moist
			3		
Macro Core	48 / 40	4T10B	4		
			5		SAME AS ABOVE
			6		
Macro Core	36 / 36	4T10C	7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD: Direct Push (Geoprobe)			BORING NO. **U4**	
SAMPLING METHOD: Geoprobe 4' Macro Core			SHEET 1 OF 1	
DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley			DRILLING	
			START	FINISH
WATER LEVEL	N/A		TIME	TIME
TIME (W.L.)	N/A		0740	0800
DATE (W.L.)	N/A		DATE	DATE
INSPECTOR	Dana Harris, URS		4/10/2002	4/10/2002

DATUM Existing Grade ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	**SAMPLES COLLECTED**	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	SURFACE CONDITIONS: Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.
			0		
		2U4A		SM	Brown to dark brown silty SAND, with organic matter, moist
			1		
			2	SM	Grades to light brown silty SAND, trace gravel, subrounded to rounded, moist
			3		
		2U4B, 2U4BFD, 2U4BLA			
Macro Core	48 / 44		4	SW - SP	Grades to light brown to yellowish red SAND, medium to fine grained, trace gravel, subrounded to rounded, moist
			5		
			6	SW	Grades to light brown SAND, medium to fine grained, slightly moist
		2U4C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
U-11 WAS NOT NEEDED TO SAMPLE ANALYZSES, COLLECTED ON LAST DAY JUST IN CASE	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. U11
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

WATER LEVEL	N/A	START	FINISH
TIME (W.L.)	N/A	TIME 1600	TIME 1620
DATE (W.L.)	N/A	DATE 4/10/2002	DATE 4/10/2002
INSPECTOR	Dana Harris, URS		

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		4U11A		SM	Dark brown silty SAND with organic matter, moist
			1		Grades to brown to light brown SAND, medium to fine grained, trace silt, moist
			2		
			3	SW	
Macro Core	48 / 40	4U11B	4		
			5		Grades to mottled greenish gray to light brown & yellowish red SAND, medium to fine grained, trace silt, slightly moist; moisture decreases with depth
			6	SW	
Macro Core	36 / 36	4U11C	7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	V5
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME 1340	TIME 1355
TIME (W.L.)	N/A		
DATE (W.L.)	N/A	DATE 4/10/2002	DATE 4/10/2002
INSPECTOR	Dana Harris, URS		

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3V5A		SM	Light brown silty SAND, moist
			1		
			2	GP-SP	Brown SAND, coarse to fine, with pebbles, subrounded to rounded, dry
			3		
		3V5B		SW	Light brown to yellowish red SAND, medium to fine grained, trace silt, slightly moist
Macro Core	48 / 38		4		
			5		SAME AS ABOVE, moisture decreases with depth
			6		
		3V5C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. V10
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1500	1520
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/10/2002	4/10/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		4V10A		GM - SM	Brown to reddish brown silty SAND with gravel and pebbles, subrounded, slightly moist
			1		
			2		
		4V10B	3	SW	Light brown to greenish gray SAND, medium to fine grained, trace silt, slightly moist
Macro Core	48 / 37		4		
			5		
			6	SW	Grades to mottled greenish gray & yellowish red SAND, medium to fine grained, slightly moist
Macro Core	36 / 36	4V10C		SW	Grades to greenish gray SAND, medium to fine grained, slightly moist
			7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	**X6**
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley		

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1538	1552
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/10/2002	4/10/2002

DATUM Existing Grade

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. No liner. Clear top 6" and proceed.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		4X6A	1	SM	Brown to dark brown silty SAND with organic matter and trace gravel, slightly moist
			2		
		4X6B, 4X6BFD, 4X6BLA	3		
Macro Core	48 / 42		4	SW	Light brown to yellowish red SAND, medium to fine grained, trace silt, moist; moisture decreases with depth
			5		
		4X6C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS

BORING NO.	J5
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	0902	0915
DATE	4/4/2002	4/4/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 7".

Liner in good condition.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1J5A		SP - SW	Olive gray to light brown SAND, medium to fine grained, dry
			1		
			2		
		1J5B	3		
Macro Core	48 / 40		4		
			5	SW	Mottled gray & reddish brown to yellowish red SAND, medium to fine grained, trace silt, slightly moist
		1J5C	6		
Macro Core	36 / 36		7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING See Appendix D, Figure D-3 for Grid Layout	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. **J7**
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING START / FINISH
	WATER LEVEL	N/A	TIME 1150 / TIME 1210
	TIME (W.L.)	N/A	
	DATE (W.L.)	N/A	DATE 4/8/2002 / DATE 4/8/2002
DATUM Liner (see notes to right) ELEVATION	INSPECTOR	Dana Harris, URS	

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 9".

Liner in fair to good condition

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2J7A		SP - SM	Light brown silty SAND and gravel, subangular to subrounded, dry
			1		
			2		
			3	SM	Light brown to greenish gray silty SAND, dry
Macro Core	48 / 43	**2J7B, 2J7BFD, 2J7BLA**	4		
			5	SP - SW	Yellowish red to reddish brown SAND, medium to fine grained, with gravel, subrounded, dry
			6	SW	Mottled gray & reddish brown SAND, medium to fine grained, trace gravel, rounded, dry
Macro Core	36 / 36	**2J7C**	7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
BORING NO.	**K6**
SHEET	1 OF 1
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS

DRILLING	START	FINISH
TIME	1000	1022
DATE	4/4/2002	4/4/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 4".

Liner in fair condition: brittle, but intact prior to cutting

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1K6A		SP	Dark brown SAND, coarse to fine grained, with gravel, subangular to subrounded, dry
			1	SP	Brown to yellowish red SAND, medium to fine grained, dry
			2		
		1K6B	3	SW - SP	Greenish gray to gray SAND, medium to fine grained, some gravel, subrounded, slightly moist
Macro Core	48 / 38		4		
			5	SW - SP	Yellowish red to reddish brown SAND, medium to fine grained, slightly moist
		1K6C, 1K6CFD, 1K6CLA	6	SW - SP	Greenish gray SAND, medium to fine grained, some gravel, subrounded, slightly moist
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. L7
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING
	WATER LEVEL	N/A	START TIME 1615 / FINISH TIME 1630
	TIME (W.L.)	N/A	
	DATE (W.L.)	N/A	DATE 4/8/2002 / DATE 4/8/2002
DATUM Liner (see notes to right) / ELEVATION	INSPECTOR	Dana Harris, URS	

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 5".

Liner in good condition.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2L7A	1	GM - SM	Brown to dark brown silty SAND, with gravel and pebbles, subrounded to rounded, slightly moist
			2		
		2L7B, 2L7BMS, 2L7BMD	3		
Macro Core	48 / 44		4		
			5	SP-SM	Reddish brown SAND, coarse to fine grained, few pebbles, subrounded to rounded, slightly moist
			6	SW	Mottled greenish gray to light brown & yellowish red SAND, medium to fine grained, trace silt, moist
Macro Core	36 / 36	2L7C	7	SM	Grades to mottled greenish gray to gray & yellowish red to reddish brown silty SAND, moist
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO. 89-F1000162.00	CLIENT Tooele Army Depot	LOCATION SWMU-10
See Appendix D, Figure D-3 for Grid Layout	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. M6
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1055	1115
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/4/2002	4/4/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 4".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1M6A		SM	Dark brown silty SAND, moist
			1		
			2	SW	Light brown SAND, coarse to fine sand, moist
			3	SM	Dark brown silty SAND, moist
		1M6B			
Macro Core	48 / 39		4	SW - SP	Reddish brown to yellowish red SAND, medium to fine grained, slightly moist
			5	SW	Greenish gray to yellowish red SAND, medium to fine grained, slightly moist
			6	SW	Mottled gray & reddish brown to yellowish red SAND, medium to fine grained, dry
		1M6C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. M8
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING
			START / FINISH
	WATER LEVEL	N/A	TIME / TIME
	TIME (W.L.)	N/A	1225 / 1245
	DATE (W.L.)	N/A	DATE / DATE
DATUM Liner (see notes to right) ELEVATION	INSPECTOR	Dana Harris, URS	4/8/2002 / 4/8/2002

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 9".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	
			0		
		2M8A		SP	Light brown to brown SAND, medium to fine grained, trace silt, trace gravel, subangular to subrounded, slightly moist
			1		
			2		
		2M8B	3	SP	Light brown to greenish gray SAND, medium to fine grained, with gravel, subrounded, moist
Macro Core	48 / 40		4		
			5	SW	Light brown to yellowish red SAND, medium to fine grained, slightly moist
		2M8C	6	SW	Mottled greenish gray to gray & yellowish red SAND, medium to fine grained, slightly moist
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	N5
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING	
WATER LEVEL	N/A	START TIME	FINISH TIME
TIME (W.L.)	N/A	1120	1130
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/4/2002	4/4/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 10".

Liner in fair condition: brittle, but intact prior to cutting

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1N5A		SP	Light brown SAND, coarse to fine grained, dry
			1		
			2		
		1N5B	3		
Macro Core	48 / 38		4		
			5	SW	Mottled greenish gray to light brown & reddish brown to yellowish red SAND, medium to fine grained, slightly moist
		1N5C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	N7
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	1310	1335
DATE	4/4/2002	4/4/2002

DATUM Liner (see notes to right)

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 7".

Liner in fair condition: brittle, but intact prior to cutting

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1N7A		GP - SP	Dark brown SAND, coarse to fine grained, with gravel, dry
			1		
			2		
		1N7B	3		
Macro Core	48 / 40		4	SP	Brown to light brown SAND, medium to fine grained, dry
			5	SW	Mottled gray to light brown & yellowish red SAND, medium to fine grained, dry
		1N7C, 1N7CFD, 1N7CLA	6	SW	Grades to greenish gray to yellowish red SAND, medium to fine grained, dry
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD: Direct Push (Geoprobe)	BORING NO. N9	
SAMPLING METHOD: Geoprobe 4' Macro Core	SHEET 1 OF 1	
DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley	DRILLING START	DRILLING FINISH
WATER LEVEL: N/A	TIME 0932	TIME 0950
TIME (W.L.): N/A		
DATE (W.L.): N/A	DATE 4/10/2002	DATE 4/10/2002
INSPECTOR: Dana Harris, URS		

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 10".

Liner in poor condition: cracked, folded, and does not fully extend over sample location

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3N9A	1	SM	Light brown to yellowish red silty SAND, trace gravel, subangular to subrounded, mois
			2		
		3N9B	3		
Macro Core	48 / 42		4		
			5	SW	Mottled greenish gray & reddish brown SAND, medium to fine grained, trace silt, moist
		3N9C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	P7
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	1500	1530
DATE	4/3/2002	4/3/2002

DATUM Liner (see notes to right)

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 6".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1P7A		GP	Brown SAND, coarse to medium grained, with pebbles and gravel, subrounded to rounded, dry
			1		
			2	GP - SP	Reddish brown SAND, coarse to medium grained, some pebbles, subrounded to rounded, dry
		1P7B	3	SW - SM	Yellowish red SAND, medium to fine grained, trace silt, moist
Macro Core	48 / 42		4		
			5		
		1P7C	6	SW	SAME AS ABOVE, silt grades out
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:		BORING NO. P9
Direct Push (Geoprobe)		SHEET 1 OF 1
SAMPLING METHOD:		
Geoprobe 4' Macro Core		
DRILLING COMPANY & DRILLER:		DRILLING
EarthProbe, Shawn Bromley		START / FINISH
WATER LEVEL	N/A	TIME: 1405 / TIME: 1425
TIME (W.L.)	N/A	
DATE (W.L.)	N/A	DATE: 4/8/2002 / DATE: 4/8/2002
INSPECTOR	Dana Harris, URS	

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 6"

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2P9A		GP - SP	Brown silty SAND and gravel, subangular to rounded, moist
			1	SP	Light brown SAND, coarse to fine grained, slightly moist
			2		
			3	SP	Light brown to greenish gray SAND, medium to fine grained, with gravel, subrounded, moist
Macro Core	48 / 37	2P9B	4	SW	Light brown to yellowish red SAND, medium to fine grained, moist
			5		
			6	SW	Mottled light brown to greenish gray & yellowish red SAND, medium to fine grained, trace silt, trace gravel, rounded, slightly moist
Macro Core	36 / 36	2P9C	7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:		BORING NO.	**Q6**
Direct Push (Geoprobe)		SHEET	1 OF 1
SAMPLING METHOD:			
Geoprobe 4' Macro Core			
DRILLING COMPANY & DRILLER:		DRILLING	
EarthProbe, Shawn Bromley		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1820	1840
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/3/2002	4/3/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 7".

Liner in fair condition: brittle, but intact prior to cutting

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1Q6A			Brown to dark brown silty SAND with pebbles, subrounded to rounded, dry
			1	SP - SM	
			2		
			3		Reddish brown SAND, medium to fine grained, trace silt, dry
		1Q6B			
Macro Core	48 / 40		4	SW - SP	
			5		Mottled gray & reddish brown to yellowish red silty SAND, dry
			6	SM	
		1Q6C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. Q8
SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING
WATER LEVEL	N/A	START TIME 1400 / FINISH TIME 1415
TIME (W.L.)	N/A	
DATE (W.L.)	N/A	START DATE 4/4/2002 / FINISH DATE 4/4/2002
INSPECTOR	Dana Harris, URS	

DATUM Liner (see notes to right)　　ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 2".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1Q8A		GP - SP	Dark brown SAND, coarse to medium grained, with gravel, dry
			1		
			2		
				SM	Light brown silty SAND, dry
			3		
		1Q8B		SP - SM	Reddish brown silty SAND, with gravel, dry
Macro Core	48 / 38		4	SM	Light brown to yellowish red silty SAND, dry
			5		
			6		
		1Q8C		SM	Mottled greenish gray & reddish brown to yellowish red silty SAND, dry
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	**R5**
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	1430	1445
DATE	4/4/2002	4/4/2002

DATUM Liner (see notes to right)

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 11.5".

Liner in fair to poor condition, cracked slightly

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1R5A			Brown to dark brown SAND, medium to fine grained, dry
			1	SW - SP	
			2		Light brown silty SAND, slightly moist
		1R5B	3	SM	
Macro Core	48 / 40		4		Grades to greenish gray to yellowish red SAND, medium to fine grained, few pebbles, dry
			5	SM - SP	
			6	SM	Grades to reddish brown SAND, medium to fine grained, few pebbles, dry
		1R5C		SM	Grades to greenish gray to yellowish red SAND, medium to fine grained, few pebbles, dry
Macro Core	36 / 36			SM	Mottled gray & reddish brown to yellowish red SAND, medium to fine grained, dry
			7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. **R8**
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME 1445	TIME 1505
TIME (W.L.)	N/A		
DATE (W.L.)	N/A		DATE
INSPECTOR	Dana Harris, URS	4/8/2002	4/8/2002

DATUM Liner (see notes to right)

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand). Depth to liner: 3".

Liner in fair to good condition: brittle but intact prior to cutting

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	
			0		
		2R8A, 2R8AFD, 2R8ALA		GM - SM	Dark brown silty SAND with gravel and pebbles, subangular to rounded, slightly moist
			1		
			2	SM	SAME AS ABOVE, pebbles grade out
				SP - SW	Light brown to yellowish red SAND, medium to fine grained, trace gravel, subrounded, moist
			3		
Macro Core	48 / 43	**2R8B**	4	SW	Greenish gray SAND, medium to fine grained, slightly moist
			5	SM	Mottled light brown to greenish gray & yellowish red silty SAND, slightly moist
Macro Core	36 / 36	**2R8C**	6		
			7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10
	DRILLING METHOD: Direct Push (Geoprobe)		BORING NO. R9
	SAMPLING METHOD: Geoprobe 4' Macro Core		SHEET 1 OF 1
	DRILLING COMPANY & DRILLER: EarthProbe, Shawn Bromley		DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1415	1440
DATE (W.L.)	N/A		DATE
INSPECTOR	Dana Harris, URS	4/8/2002	4/8/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 7".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2R9A		SP - SW	Brown to dark brown SAND, medium to fine grained, trace silt, moist
			1		
			2	SP - SW	Light brown to yellowish red SAND, medium to fine grained, trace gravel, subrounded to rounded, slightly moist
			3		
		2R9B			
Macro Core	48 / 40		4		
			5	SP - SW	Mottled greenish gray to gray & yellowish red to reddish brown SAND, medium to fine grained, trace silt, trace gavel, subrounded to rounded, slightly moist
			6		
		2R9C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	S7
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	1555	1610
DATE	4/4/2002	4/4/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 4".

Liner in fair to poor condition, slightly cracked

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1S7A		GM - SM	Light brown to yellowish red silty SAND and gravel, subangular to subrounded, slightly moist
			1		
			2	GM - SM	Reddish brown silty SAND with gravel and pebbles, subangular to rounded, slightly moist
			3		
		1S7B		SM	Light brown to yellowish red silty SAND, dry
Macro Core	48 / 40		4		
			5	SM	Grades to light brown silty SAND, slightly moist
			6		
Macro Core	36 / 36	S7C, 1S7CFD, 1S7CLA, 1S7CL	7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO.	T5
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET	1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING	

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	0730	0745
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/8/2002	4/8/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 11".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		1T5A		GP - SP	Dark brown SAND, coarse to medium grained, with gravel, subangular to rounded, moist
			1		
			2	SP - SW	Light brown SAND, coarse to medium grained, slightly moist
		1T5B	3		
Macro Core	48 / 39		4		
			5		SAME AS ABOVE
		1T5C, 1T5CFD, 1T5CLA	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. T8
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1548	1605
DATE (W.L.)	N/A		DATE
INSPECTOR	Dana Harris, URS	4/8/2002	4/8/2002

DATUM Liner (see notes to right)

ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 9".

Liner in good condition.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
		2T8A	0	GP-SP	Brown to dark brown SAND, coarse to fine grained, with pebbles, subrounded to rounded, moist
			1		
			2		
		2T8B	3	SP-SM	Brown to reddish brown silty SAND and gravel, subrounded to rounded, slightly moist
Macro Core	48 / 42		4	SW	Light brown to yellowish red SAND, medium to fine grained, trace silt, moist
			5		
			6		SAME AS ABOVE
Macro Core	36 / 36	T8C, 2T8CFD, 2T8CLA, 2T8CL	7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)
SAMPLING METHOD:	Geoprobe 4' Macro Core
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley
WATER LEVEL	N/A
TIME (W.L.)	N/A
DATE (W.L.)	N/A
INSPECTOR	Dana Harris, URS
BORING NO.	U6
SHEET	1 OF 1

DRILLING	START	FINISH
TIME	0803	0817
DATE	4/10/2002	4/10/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 16"

Liner in fair condition: brittle but intact prior to cutting

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2U6A		GP - SP	Brown to dark brown SAND, coarse to fine grained, with pebbles, subrounded to rounded, slightly moist
			1		
			2		
		2U6B	3	SP	Brown to light brown SAND, medium to fine grained, slightly moist
Macro Core	48 / 40		4		
			5	SW	Light brown to yellowish red SAND, medium to fine grained, slightly moist
		2U6C	6		
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. U9
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING

		START		FINISH
WATER LEVEL	N/A	TIME		TIME
TIME (W.L.)	N/A	0950		1003
DATE (W.L.)	N/A	DATE		DATE
INSPECTOR	Dana Harris, URS	4/10/2002		4/10/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), plastic debris. Depth to liner: 7".

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		2U9A			Dark brown to reddish brown silty SAND, moist
			1		
				SM	
			2		
			3		
		2U9B		SW	Light brown to yellowish red SAND, medium to fine grained, moist
Macro Core	48 / 40		4		
					Mottled light brown & yellowish red to reddish brown SAND, medium to fine grained, trace silt, slightly moist
			5	SW	
			6		
		2U9C			
Macro Core	36 / 36		7		
					Terminate boring at 7' depth below datum
			8		
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
See Appendix D, Figure D-3 for Grid Layout	89-F1000162.00	Tooele Army Depot	SWMU-10

DRILLING METHOD:	Direct Push (Geoprobe)	BORING NO. V7
SAMPLING METHOD:	Geoprobe 4' Macro Core	SHEET 1 OF 1
DRILLING COMPANY & DRILLER:	EarthProbe, Shawn Bromley	DRILLING

		START	FINISH
WATER LEVEL	N/A	TIME	TIME
TIME (W.L.)	N/A	1400	1415
DATE (W.L.)	N/A	DATE	DATE
INSPECTOR	Dana Harris, URS	4/10/2002	4/10/2002

DATUM Liner (see notes to right) ELEVATION

SURFACE CONDITIONS

Fill (cobbles, gravels, sand), vegetation. Depth to liner: 10"

Liner in poor condition, cracked.

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	SAMPLES COLLECTED	DEPTH IN FEET (Below Datum)	LEGEND Fill shaded (approximate)	DESCRIPTION
			0		
		3V7A		GP - SP	Brown to reddish brown silty SAND with gravel and pebbles, subangular to rounded, slightly moist
			1		
			2		
			3		
		3V7B, 3V7BFD, 3V7BLA		SM	Brown to yellowish red silty SAND, slightly moist
Macro Core	48 / 42		4		
			5	SW	Light brown to yellowish red SAND, medium to fine grained, trace silt, slightly moist
			6		
		3V7C			
Macro Core	36 / 36		7		
			8		Terminate boring at 7' depth below datum
			9		
			0		
			1		
			2		
			3		
			4		
			5		
			6		
			7		
			8		
			9		
			0		

ATTACHMENT B
Chains of Custody

DATA CHEM LABORATORIES, INC.

02C-0080

SDG# TEAD01 TEAD02

DataChem Laboratories, Inc.

Field Chain-of-Custody Record

Client Name & Address: URS Corp. 7101 Wisconsin Ave., Suite 700 Bethesda, MD 20814

Phone: 301-652-2215

FAX: 301-656-8059

e-mail:

Project No.: 89-F1000162.00

Project Name: TEAD SWMU-10

Sampler: (Signature)

Field Sample ID	Matrix Code	Date	Time	Depth	DCL Sample Number	Preservation Code	Sample Matrix Code	Sample QC Matrix Code	Explosives (8330)	No. of Containers	Remarks
SOURCE 1		4/3/02	0805	-	02C00689				X	2*	*24-hour TAT*
IE6BMS		4/3/02	0942		90 MS				X	1	Standard
IE6BMD		4/3/02	0942		9190 MSD				X	1	TAT
IE6CLA		4/3/02	0945		9290				X	1	
IP3CLA		4/3/02	1142		9391				X	1	

Matrix Codes: W) Water B) Bulk L) Liquid F) Filter S) Soil G) Wipe C) Solid M) Media

Preservation Codes:
1) Cool to 4°C
2) HCl to pH<2, 4°C
3) H_2SO_4 to pH<2, 4°C
4) HNO_3 to pH<2, 4°C
5) NaOH to pH>12, 4°C
6) ZnOAc/NaOH to pH>9, 4°C

Possible Hazard Identification
- ☐ Non-Hazard ☐ Skin Irritant ☐ Rad
- ☐ Flammable ☐ Poison ☒ Unknown

Sample Disposal
- ☐ Return to Client ☐ Archive for ____ Months
- ☒ Disposal by Lab per Ed Fahnline
(a fee may be assessed if samples are retained longer than 3 months)

Requested Turn Around Time * Standard except as noted
- ☐ 48 Hours (Rush) ☐ 7 Days ☐ 21 Days
- ☐ 72 Hours (Rush) ☐ 14 Days ☐ Other
(Rush is email or fax data unless previously approved)

Carrier/Airbill #:

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
(signature) (by courier) 4/3/02 1630	by Courier		
Courier	(signature) R-33-1	4/3/02	1730

Shipped to: DataChem Laboratories, Inc. 960 West LeVoy Drive Salt Lake City, UT 84123 Phone: (800) 356-9135 Phone: (801) 266-7700 FAX: (801) 268-9992 www.datachem.com

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DATA CHEM LABORATORIES, INC

02C-0083
SDG# TEAD03

DataChem Laboratories, Inc.
Field Chain-of-Custody Record

Client Name & Address: URS Corporation
7101 Wisconsin Ave., Suite 700
Bethesda, MD 20814

Phone: 301-652-2215
FAX: 301-656-8059
e-mail:

Project No.: 89F1000162.00
Project Name: TEAD - SMWU - 10 Soil Samples
Sampler: (Signature)

Field Sample Number	Site ID	Date	Time	Depth	DCL Sample Number	Preservation Code	Sample Matrix Code	Sample for Matrix QC	Explosives (8330)	No. of Containers	Remarks
1EB		4/4/02	0710	-	02C00699	-	W		X	2	
1H5CLA		4/4/02	0759	-	700	-	S		X	1	
1I8CLA		4/4/02	0855	-	01	-	S		X	1	
1K6CLA		4/4/02	1012	-	02	-	S		X	1	
1N7CLA		4/4/02	1725	-	03	-	S		X	1	
1S7CLA		4/4/02	1605	-	04	-	S		X	1	
1S7CLD		4/4/02	1605	-	05	-	S		X	1	

Analyses Requested

Matrix Codes: W) Water, B) Bulk, L) Liquid, F) Filter, S) Soil, C) Solid, M) Media

Preservation Codes: 1) Cool to 4°C, 2) HCl to pH<2, 4°C, 3) H_2SO_4 to pH<2, 4°C, 4) HNO_3 to pH<2, 4°C, 5) NaOH to pH>12, 4°C, 6) ZnOAc/NaOH to pH>9, 4°C

E-96

Possible Hazard Identification
- ☐ Non-Hazard ☐ Skin Irritant ☐ Rad
- ☐ Flammable ☐ Poison ☒ Unknown

Sample Disposal
- ☐ Return to Client ☐ Archive for ____ Months
- ☒ Disposal by Lab

(a fee may be assessed if samples are retained longer than 3 months)

Requested Turn Around Time Standard
- ☐ 48 Hours (Rush) ☐ 7 Days ☐ 21 Days
- ☐ 72 Hours (Rush) ☐ 14 Days ☐ Other

(Rush is email or fax data unless previously approved)

Carrier/Airbill #:

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
4/4/02 1830	(FIELD LAB)	4/4/02	1833
K&L Courier Via courier	R-33-1	4/5/02	1400

Shipped to: DataChem Laboratories, Inc. 960 West LeVoy Drive, Salt Lake City, Utah 84123, Phone: (800) 356-9135, Phone: (801) 266-7700, FAX: (801) 268-9992, www.datachem.com

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DATA CHEM LABORATORIES, INC.

02C-0086
SDG# TEAD04

DataChem Laboratories, Inc.
Field Chain-of-Custody Record

Client Name & Address: URS
7101 Wisconsin Ave., Suite 700
Bethesda, MD 20814

Phone: 301-652-2215
FAX: 301-656-3059
e-mail:

Project No.: 39F1000162.00
Project Name: TEAD SWMU 10
Sampler: (Signature)

Matrix Codes: W) Water, B) Bulk, L) Liquid, F) Filter, S) Soil, G) Wipe, C) Solid, M) Media

Preservation Codes:
1) Cool to 4°C
2) HCl to pH<2, 4°C
3) H_2SO_4 to pH<2, 4°C
4) HNO_3 to pH<2, 4°C
5) NaOH to pH>12, 4°C
6) ZnOAc/NaOH to pH>9, 4°C

Field Sample Number	Site ID	Date	Time	Depth	DCL Sample Number	Preservation Code	Sample Matrix Code	Sample for Matrix QC	Analyses Requested: Explosives (8330)	No. of Containers	Remarks
1TSCLA		4/8/02	0740	-	02C00733	-	S		X	1	
1H4BLA		4/8/02	0837	-	34	-	S	-	X	1	
2EB		4/8/02	1110	-	32	-	W	-	X	2	
2J7BLA		4/8/02	1157	-	35	-	S	-	X	1	
2R8ALA		4/8/02	1445	-	36	-	S	-	X	1	
2T8CLA		4/8/02	1600	-	37	-	S	-	X	1	
2T8CLD		4/8/02	1600	-	38	-	S	-	X	1	
2L7BMS		4/8/02	1618	-	4/9/02 37MS 39	-	S	X	X	1	Matrix Spike
2L7BMD		4/8/02	1618	-	37MSD 40	-	S	X	X	1	Matrix Spike Duplicate

Possible Hazard Identification
☐ Non-Hazard ☐ Skin Irritant ☐ Rad
☐ Flammable ☐ Poison ☒ Unknown

Sample Disposal
☐ Return to Client ☐ Disposal by Lab — Per contract ☐ Archive for ____ Months
(a fee may be assessed if samples are retained longer than 3 months)

Requested Turn Around Time Standard
☐ 48 Hours (Rush) ☐ 7 Days ☐ 21 Days
☐ 72 Hours (Rush) ☐ 14 Days ☐ Other
(Rush is email or fax data unless previously approved)

Carrier/Airbill #:

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
[signature] 4/8/02 1830	[signature]	4/8/02	1832
VIA COURIER	[signature] R-33-1	4/9/02	1300

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DataChem Laboratories, Inc.
960 West LeVoy Drive
Salt Lake City, UT 84123
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Phone: (801) 266-7700
FAX: (801) 268-9992
www.datachem.com

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DATA CHEM LABORATORIES, INC.

~~02E-0119~~ JP 4/15/02

02C-0092

SDG# TEAD05

DataChem Laboratories, Inc.

Field Chain-of-Custody Record

(2) coolers

Client Name & Address: URS
7101 Wisconsin Ave., Suite 700
Bethesda, MD 20814

Phone: 301-652-2215

FAX: 301-656-8059

e-mail:

Project No.: 89F1000162.00

Project Name: TEAD-SWMU-10 Soil Sampling

Sampler: (Signature)

Matrix Codes:
W) Water B) Bulk
L) Liquid F) Filter
S) Soil G) Wipe
C) Solid M) Media

Preservation Codes:
1) Cool to 4°C
2) HCl to pH<2, 4°C
3) H_2SO_4 to pH<2, 4°C
4) HNO_3 to pH<2, 4°C
5) NaOH to pH>12, 4°C
6) ZnOAc/NaOH to pH>9, 4°C

Analyses Requested

Field Sample Number	Site ID	Date	Time	Depth	DCL Sample Number	Preservation Code	Sample Matrix Code	Sample for Matrix QC	Explosives (8330)	pH	Reactivity	Ignitability					No. of Containers	Remarks
2U4BLA	-	4/10/02	0747	-	JP 4/15/02 ~~02E~~ 02C00787	-	S	-	X								1	
3010BLA	-	4/10/02	0912	-	88	-	S	-	X								1	
3EB	-	4/10/02	1030	-	93	-	W	-	X								2	
3A9ALA	-	4/10/02	1050	-	89	-	S	-	X								1	
3V7BLA	-	4/10/02	1405	-	90	-	S	-	X								1	
4X6BLA	-	4/10/02	1542	-	91	-	S	-	X								1	
WASTELABSOIL	-	4/11/02	1700	-	92	-	S	-	X	X	X	X					3	Lab waste - soil jars, excess soil
WASTELABSOLV	-	4/11/02	1745	-	94	-	L	-	X	X	X	X					4	Lab waste - used solvent
WASTEDECON	-	4/11/02	1845	-	95	-	W	-	X	X	X	X					4	Decon waste

Possible Hazard Identification
☐ Non-Hazard ☐ Skin Irritant ☐ Rad
☐ Flammable ☐ Poison ☒ Unknown

Sample Disposal per contract
☐ Return to Client ☐ Archive for ____ Months
☐ Disposal by Lab
(a fee may be assessed if samples are retained longer than 3 months)

Requested Turn Around Time Standard
☐ 48 Hours (Rush) ☐ 7 Days ☐ 21 Days
☐ 72 Hours (Rush) ☐ 14 Days ☐ Other
(Rush is email or fax data unless previously approved)

Carrier/Airbill #:

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Received by: (Signature)	4/12/02	1425
Relinquished by: (Signature)	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Received by: (Signature)	Date	Time

Shipped to:
DataChem Laboratories, Inc.
960 West LeVoy Drive
Salt Lake City, UT 84123
Phone: (800) 356-9135
Phone: (801) 266-7700
FAX: (801) 268-9992
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ATTACHMENT C
Chemical Data

- Data Qualifying Codes
- Field Laboratory Results
- Field Laboratory QC Results
- Field Laboratory Dilution Results
- Field Laboratory QC Dilution Results
- DataChem Laboratory Results
- DataChem Laboratory QC Results

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analyte indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
C	For reactive cyanide, MS or LCS recoveries less than 30%, but greater than zero.

The other type of code used by Dames & Moore is a "Reason Code". The reason code indicates the type of quality control failure that lead to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
c	Calibration failure; poor or unstable response	b	Instrument performance failure	c	Calibration failure
d	MS/MSD imprecision	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
e	LCSD imprecision	d	MS/MSD imprecision	e	LCSD imprecision
f	Field duplicate imprecision	e	LCSD imprecision	f	Field duplicate imprecision
h	Holding time violation	f	Field duplicate imprecision	h	Holding time violation
i	Internal standard failure	g	Dual column confirmation imprecision	k	Laboratory duplicate imprecision
j	Poor mass spectrometer performance	h	Holding time violation	l	LCS recovery failure
l	LCS recovery failure	i	Internal standard failure	m	MS/MSD recovery failure
m	MS/MSD recovery failure	l	LCS recovery failure	n	ICS failure
p	Poor chromatography	m	MS/MSD recovery failure	o	Calibration blank contamination
r	linearity failure in initial calibration	p	Poor chromatography	p	Preparation blank contamination
s	Surrogate failure	r	linearity failure in initial calibration	r	Linearity failure in calibration or MSA
t	Tuning failure	s	Surrogate failure	s	Serial dilution failure
w	Identification criteria failure	u	No confirmation column	v	Post-digestion spike failure
x	Field blank contamination	w	Retention time failure	x	Field blank contamination
y	Trip blank contamination	x	Field blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	z	Method blank contamination	Q	Other - see bottom of data report for explanation
Q	Other - see bottom of data report for explanation	Q	Other - see bottom of data report for explanation		
k	Tentatively Identified Compounds (TICs)				

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
C5	1C5A	4/3/2002	TNT		0.7	µg/g			1
C5	1C5A	4/3/2002	RDX		0.8	µg/g			1
C5	1C5B	4/3/2002	TNT		0.7	µg/g			1
C5	1C5B	4/3/2002	RDX		0.8	µg/g			1
C5	1C5C	4/3/2002	TNT	0.9	0.7	µg/g			1
C5	1C5C	4/3/2002	RDX		0.8	µg/g			1
C7	1C7A	4/3/2002	TNT	5	0.7	µg/g			1
C7	1C7B	4/3/2002	TNT		0.7	µg/g			1
C7	1C7B	4/3/2002	RDX		0.8	µg/g			1
C7	1C7C	4/3/2002	TNT		0.7	µg/g			1
C7	1C7C	4/3/2002	RDX	2.4	0.8	µg/g			1
E6	1E6A	4/3/2002	TNT		0.7	µg/g			1
E6	1E6A	4/3/2002	RDX		0.8	µg/g			1
E6	1E6B	4/3/2002	TNT		0.7	µg/g			1
E6	1E6B	4/3/2002	RDX		0.8	µg/g			1
E6	1E6C	4/3/2002	TNT		0.7	µg/g			1
E6	1E6C	4/3/2002	RDX		0.8	µg/g			1
E9	1E9A	4/3/2002	TNT	1.3	0.7	µg/g			1
E9	1E9A	4/3/2002	RDX	13	0.8	µg/g			1
E9	1E9B	4/3/2002	TNT		0.7	µg/g			1
E9	1E9B	4/3/2002	RDX		0.8	µg/g			1
E9	1E9C	4/3/2002	TNT	0.8	0.7	µg/g			1
E9	1E9C	4/3/2002	RDX		0.8	µg/g			1
G6	1G6A	4/3/2002	TNT		0.7	µg/g			1
G6	1G6A	4/3/2002	RDX		0.8	µg/g			1
G6	1G6B	4/3/2002	TNT		0.7	µg/g			1
G6	1G6B	4/3/2002	RDX		0.8	µg/g			1
G6	1G6C	4/3/2002	TNT		0.7	µg/g			1
G6	1G6C	4/3/2002	RDX		0.8	µg/g			1
G8	1G8A	4/3/2002	TNT		0.7	µg/g			1
G8	1G8A	4/3/2002	RDX		0.8	µg/g			1
G8	1G8B	4/3/2002	TNT		0.7	µg/g			1
G8	1G8B	4/3/2002	RDX		0.8	µg/g			1
G8	1G8C	4/3/2002	TNT	4.8	0.7	µg/g			1
G8	1G8C	4/3/2002	RDX		0.8	µg/g			1
P3	1P3A	4/3/2002	TNT	2.0	0.7	µg/g			1
P3	1P3A	4/3/2002	RDX		0.8	µg/g			1
P3	1P3B	4/3/2002	TNT		0.7	µg/g			1
P3	1P3B	4/3/2002	RDX		0.8	µg/g			1
P3	1P3C	4/3/2002	TNT	1.7	0.7	µg/g			1
P3	1P3C	4/3/2002	RDX		0.8	µg/g			1
P7	1P7A	4/3/2002	TNT	2.3	0.7	µg/g			1
P7	1P7A	4/3/2002	RDX	23.9	0.8	µg/g			1
P7	1P7B	4/3/2002	RDX	5.4	0.8	µg/g			1
Q4	1Q4A	4/3/2002	TNT	0.7	0.7	µg/g			1
Q4	1Q4A	4/3/2002	RDX		0.8	µg/g			1
Q4	1Q4B	4/3/2002	TNT	1.4	0.7	µg/g			1
Q4	1Q4B	4/3/2002	RDX		0.8	µg/g			1
Q4	1Q4C	4/3/2002	TNT	1.6	0.7	µg/g			1

FIELD LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
Q4	1Q4C	4/3/2002	RDX		0.8	µg/g			1
Q6	1Q6A	4/3/2002	TNT	7.8	0.7	µg/g			1
Q6	1Q6B	4/3/2002	RDX	14.0	0.8	µg/g			1
Q6	1Q6C	4/3/2002	TNT	28.0	0.7	µg/g			1
H5	1H5A	4/4/2002	TNT		0.7	µg/g			1
H5	1H5A	4/4/2002	RDX		0.8	µg/g			1
H5	1H5B	4/4/2002	TNT		0.7	µg/g			1
H5	1H5B	4/4/2002	RDX		0.8	µg/g			1
Q6	1Q6A DL	4/3/2002	RDX	128.9	4	µg/g			5
Q6	1Q6C DL	4/3/2002	RDX	474.7	40	µg/g			50
Q6	1Q6B DL	4/3/2002	TNT	7430.3	350	µg/g			500
P7	1P7B DL	4/3/2002	TNT	665.6	350	µg/g			500
P7	1P7C DL	4/3/2002	TNT	2987.6	350	µg/g			500
P7	1P7C DL	4/3/2002	RDX	392.1	16	µg/g			20
C7	1C7A DL	4/3/2002	RDX	150	8	µg/g			10
H5	1H5C	4/4/2002	TNT		0.7	µg/g			1
H5	1H5C	4/4/2002	RDX		0.8	µg/g			1
I6	1I6A	4/4/2002	TNT		0.7	µg/g			1
I6	1I6A	4/4/2002	RDX		0.8	µg/g			1
I6	1I6B	4/4/2002	TNT		0.7	µg/g			1
I6	1I6B	4/4/2002	RDX		0.8	µg/g			1
I6	1I6C	4/4/2002	TNT	5.1	0.7	µg/g			1
I6	1I6C	4/4/2002	RDX	0.8	0.8	µg/g	J	I	1
N7	1N7A	4/4/2002	TNT	2.4	0.7	µg/g			1
N7	1N7B	4/4/2002	RDX	1.5	0.8	µg/g	J	I	1
N7	1N7C	4/4/2002	TNT	5.2	0.7	µg/g			1
N7	1N7C	4/4/2002	RDX	1.3	0.8	µg/g	J	I	1
Q8	1Q8A	4/4/2002	TNT	15.9	0.7	µg/g			1
Q8	1Q8C	4/4/2002	TNT	16.6	0.7	µg/g			1
R5	1R5A	4/4/2002	TNT	1.6	0.7	µg/g			1
R5	1R5B	4/4/2002	TNT		0.7	µg/g			1
R5	1R5B	4/4/2002	RDX		0.8	µg/g			1
R5	1R5C	4/4/2002	TNT	1.9	0.7	µg/g			1
R5	1R5C	4/4/2002	RDX		0.8	µg/g			1
S7	1S7C	4/4/2002	RDX	1.4	0.8	µg/g	J	I	1
N7	1N7B	4/4/2002	TNT	253.9	35	µg/g			50
Q8	1Q8B	4/4/2002	TNT	164.1	70	µg/g			100
S7	1S7C	4/4/2002	TNT	99.1	70	µg/g			100
S4	1S4A	4/4/2002	TNT		0.7	µg/g			1
S4	1S4A	4/4/2002	RDX		0.8	µg/g			1
S4	1S4B	4/4/2002	TNT		0.7	µg/g			1
S4	1S4B	4/4/2002	RDX		0.8	µg/g			1
S4	1S4C	4/4/2002	TNT	2.8	0.7	µg/g			1
S4	1S4C	4/4/2002	RDX		0.8	µg/g			1
S7	1S7A	4/4/2002	TNT	3.1	0.7	µg/g			1
S7	1S7B	4/4/2002	RDX	4.2	0.8	µg/g	J	I	1
I8	1I8A	4/4/2002	TNT		0.7	µg/g			1
I8	1I8A	4/4/2002	RDX		0.8	µg/g			1
I8	1I8B	4/4/2002	TNT		0.7	µg/g			1
I8	1I8B	4/4/2002	RDX		0.8	µg/g			1

FIELD LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
I8	1I8C	4/4/2002	TNT	5.1	0.7	µg/g			1
I8	1I8C	4/4/2002	RDX		0.8	µg/g			1
J5	1J5A	4/4/2002	TNT		0.7	µg/g			1
J5	1J5A	4/4/2002	RDX		0.8	µg/g			1
J5	1J5B	4/4/2002	TNT		0.7	µg/g			1
J5	1J5B	4/4/2002	RDX		0.8	µg/g			1
J5	1J5C	4/4/2002	TNT	1.7	0.7	µg/g			1
J5	1J5C	4/4/2002	RDX		0.8	µg/g			1
K4	1K4A	4/4/2002	TNT		0.7	µg/g			1
K4	1K4A	4/4/2002	RDX		0.8	µg/g			1
K4	1K4B	4/4/2002	TNT		0.7	µg/g			1
K4	1K4B	4/4/2002	RDX		0.8	µg/g			1
K4	1K4C	4/4/2002	TNT	0.8	0.7	µg/g			1
K4	1K4C	4/4/2002	RDX		0.8	µg/g			1
K6	1K6A	4/4/2002	TNT	1.6	0.7	µg/g			1
K6	1K6B	4/4/2002	TNT	0.9	0.7	µg/g			1
K6	1K6B	4/4/2002	RDX		0.8	µg/g			1
S7	1S7B	4/4/2002	TNT	1541.8	70	µg/g			100
N7	1N7A	4/4/2002	RDX	41.7	1.6	µg/g	J	I	2
Q8	1Q8A	4/4/2002	RDX	127.8	4	µg/g	J	I	5
Q8	1Q8B	4/4/2002	RDX	946.6	40	µg/g	J	I	50
Q8	1Q8C	4/4/2002	RDX	80.1	4	µg/g	J	I	5
R5	1R5A	4/4/2002	RDX	135.4	8	µg/g	J	I	10
K6	1K6C	4/4/2002	TNT	2.2	0.7	µg/g			1
K6	1K6C	4/4/2002	RDX		0.8	µg/g			1
M4	1M4A	4/4/2002	TNT		0.7	µg/g			1
M4	1M4A	4/4/2002	RDX		0.8	µg/g			1
M4	1M4B	4/4/2002	TNT		0.7	µg/g			1
M4	1M4B	4/4/2002	RDX		0.8	µg/g			1
M4	1M4C	4/4/2002	TNT	2.4	0.7	µg/g			1
M4	1M4C	4/4/2002	RDX		0.8	µg/g			1
M6	1M6A	4/4/2002	TNT	0.9	0.7	µg/g			1
M6	1M6A	4/4/2002	RDX	15.6	0.8	µg/g			1
M6	1M6B	4/4/2002	TNT	6.7	0.7	µg/g			1
M6	1M6B	4/4/2002	RDX	1.1	0.8	µg/g			1
M6	1M6C	4/4/2002	TNT	5.1	0.7	µg/g			1
M6	1M6C	4/4/2002	RDX		0.8	µg/g			1
N5	1N5A	4/4/2002	TNT		0.7	µg/g			1
N5	1N5A	4/4/2002	RDX		0.8	µg/g			1
N5	1N5B	4/4/2002	TNT	1.6	0.7	µg/g			1
N5	1N5B	4/4/2002	RDX		0.8	µg/g			1
N5	1N5C	4/4/2002	TNT	7.1	0.7	µg/g			1
N5	1N5C	4/4/2002	RDX		0.8	µg/g			1
S7	1S7A	4/4/2002	RDX	50.3	4	µg/g			5
K6	1K6A	4/4/2002	RDX	48.6	4	µg/g			5
T5	1T5A	4/8/2002	TNT	1.7	0.7	µg/g			1
T5	1T5B	4/8/2002	TNT	4.2	0.7	µg/g			1
T5	1T5B	4/8/2002	RDX	30.1	0.8	µg/g			1
T5	1T5C	4/8/2002	TNT	5.8	0.7	µg/g			1
T5	1T5C	4/8/2002	RDX	0.85	0.8	µg/g			1

FIELD LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
E4	1E4A	4/8/2002	TNT		0.7	µg/g			1
E4	1E4A	4/8/2002	RDX		0.8	µg/g			1
E4	1E4B	4/8/2002	TNT		0.7	µg/g			1
E4	1E4B	4/8/2002	RDX		0.8	µg/g			1
E4	1E4C	4/8/2002	TNT		0.7	µg/g			1
E4	1E4C	4/8/2002	RDX		0.8	µg/g			1
H4	1H4A	4/8/2002	TNT		0.7	µg/g			1
H4	1H4A	4/8/2002	RDX		0.8	µg/g			1
H4	1H4B	4/8/2002	TNT		0.7	µg/g			1
H4	1H4B	4/8/2002	RDX		0.8	µg/g			1
H4	1H4C	4/8/2002	TNT		0.7	µg/g			1
H4	1H4C	4/8/2002	RDX		0.8	µg/g			1
J3	1J3A	4/8/2002	TNT		0.7	µg/g			1
J3	1J3A	4/8/2002	RDX		0.8	µg/g			1
J3	1J3B	4/8/2002	TNT		0.7	µg/g			1
J3	1J3B	4/8/2002	RDX		0.8	µg/g			1
J3	1J3C	4/8/2002	TNT		0.7	µg/g			1
J3	1J3C	4/8/2002	RDX		0.8	µg/g			1
L3	1L3A	4/8/2002	TNT		0.7	µg/g			1
L3	1L3A	4/8/2002	RDX		0.8	µg/g			1
L3	1L3B	4/8/2002	TNT		0.7	µg/g			1
L3	1L3B	4/8/2002	RDX		0.8	µg/g			1
L3	1L3C	4/8/2002	TNT	3.4	0.7	µg/g			1
L3	1L3C	4/8/2002	RDX		0.8	µg/g			1
N3	1N3A	4/8/2002	TNT	1.6	0.7	µg/g			1
N3	1N3A	4/8/2002	RDX		0.8	µg/g			1
N3	1N3B	4/8/2002	TNT		0.7	µg/g			1
N3	1N3B	4/8/2002	RDX		0.8	µg/g			1
N3	1N3C	4/8/2002	TNT		0.7	µg/g			1
N3	1N3C	4/8/2002	RDX		0.8	µg/g			1
B6	2B6A	4/8/2002	TNT	0.7	0.7	µg/g			1
B6	2B6A	4/8/2002	RDX		0.8	µg/g			1
B6	2B6B	4/8/2002	TNT		0.7	µg/g			1
B6	2B6B	4/8/2002	RDX		0.8	µg/g			1
B6	2B6C	4/8/2002	TNT	1.0	0.7	µg/g			1
B6	2B6C	4/8/2002	RDX		0.8	µg/g			1
B8	2B8A	4/8/2002	TNT		0.7	µg/g			1
B8	2B8B	4/8/2002	TNT		0.7	µg/g			1
B8	2B8B	4/8/2002	RDX		0.8	µg/g			1
B8	2B8C	4/8/2002	TNT		0.7	µg/g			1
B8	2B8C	4/8/2002	RDX	1.5	0.8	µg/g			1
D6	2D6A	4/8/2002	TNT		0.7	µg/g			1
D6	2D6A	4/8/2002	RDX	3.9	0.8	µg/g			1
D6	2D6B	4/8/2002	TNT		0.7	µg/g			1
D6	2D6B	4/8/2002	RDX		0.8	µg/g			1
D6	2D6C	4/8/2002	TNT		0.7	µg/g			1
D6	2D6C	4/8/2002	RDX		0.8	µg/g			1
J7	2J7A	4/8/2002	TNT	1.4	0.7	µg/g			1
J7	2J7A	4/8/2002	RDX	4.7	0.8	µg/g			1
J7	2J7B	4/8/2002	TNT		0.7	µg/g			1

FIELD LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
J7	2J7B	4/8/2002	RDX	3.3	0.8	µg/g	J	f	1
J7	2J7C	4/8/2002	TNT	1.4	0.7	µg/g			1
J7	2J7C	4/8/2002	RDX	21.3	0.8	µg/g			1
M8	2M8A	4/8/2002	TNT	2.5	0.7	µg/g			1
M8	2M8B	4/8/2002	TNT	0.9	0.7	µg/g			1
M8	2M8B	4/8/2002	RDX	2.8	0.8	µg/g			1
M8	2M8C	4/8/2002	TNT	2.0	0.7	µg/g			1
M8	2M8C	4/8/2002	RDX		0.8	µg/g			1
R8	2R8B	4/8/2002	TNT	4.2	0.7	µg/g			1
R8	2R8C	4/8/2002	TNT	4.1	0.7	µg/g			1
R8	2R8C	4/8/2002	RDX	1.2	0.8	µg/g			1
R9	2R9A	4/8/2002	TNT	1.4	0.7	µg/g			1
R9	2R9A	4/8/2002	RDX	5.4	0.8	µg/g			1
R9	2R9B	4/8/2002	TNT	1.7	0.7	µg/g			1
R9	2R9B	4/8/2002	RDX	6.0	0.8	µg/g			1
R9	2R9C	4/8/2002	TNT	6.1	0.7	µg/g			1
R9	2R9C	4/8/2002	RDX		0.8	µg/g			1
P9	2P9A	4/8/2002	TNT	2.6	0.7	µg/g			1
P9	2P9A	4/8/2002	RDX	22.0	0.8	µg/g			1
P9	2P9B	4/8/2002	TNT	3.7	0.7	µg/g			1
P9	2P9C	4/8/2002	TNT	4.1	0.7	µg/g			1
P9	2P9C	4/8/2002	RDX	1.4	0.8	µg/g			1
L7	2L7A	4/8/2002	TNT	1.5	0.7	µg/g			1
L7	2L7A	4/8/2002	RDX	13.9	0.8	µg/g			1
L7	2L7B	4/8/2002	TNT	16.0	0.7	µg/g			1
L7	2L7B	4/8/2002	RDX	28.0	0.8	µg/g			1
L7	2L7C	4/8/2002	TNT	4.7	0.7	µg/g			1
L7	2L7C	4/8/2002	RDX		0.8	µg/g			1
T8	2T8A	4/8/2002	TNT	8.2	0.7	µg/g			1
T8	2T8B	4/8/2002	TNT	12.2	0.7	µg/g			1
T8	2T8B	4/8/2002	RDX		0.8	µg/g			1
T8	2T8C	4/8/2002	RDX	1.2	0.8	µg/g			1
U4	2U4A	4/10/2002	TNT	1.9	0.7	µg/g			1
U4	2U4A	4/10/2002	RDX		0.8	µg/g			1
U4	2U4B	4/10/2002	TNT		0.7	µg/g			1
U4	2U4B	4/10/2002	RDX		0.8	µg/g			1
U4	2U4C	4/10/2002	TNT	3.1	0.7	µg/g			1
U4	2U4C	4/10/2002	RDX		0.8	µg/g			1
U6	2U6B	4/10/2002	RDX	1.2	0.8	µg/g			1
U6	2U6C	4/10/2002	TNT	22.1	0.7	µg/g			1
U6	2U6C	4/10/2002	RDX		0.8	µg/g			1
Q10	3Q10A	4/10/2002	TNT		0.7	µg/g			1
Q10	3Q10A	4/10/2002	RDX		0.8	µg/g			1
Q10	3Q10B	4/10/2002	TNT		0.7	µg/g			1
Q10	3Q10B	4/10/2002	RDX		0.8	µg/g			1
Q10	3Q10C	4/10/2002	TNT	1.0	0.7	µg/g			1
Q10	3Q10C	4/10/2002	RDX		0.8	µg/g			1
O10	3O10A	4/10/2002	TNT	0.8	0.7	µg/g			1
O10	3O10A	4/10/2002	RDX		0.8	µg/g			1
O10	3O10B	4/10/2002	TNT		0.7	µg/g			1

FIELD LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
O10	3O10B	4/10/2002	RDX		0.8	µg/g			1
O10	3O10C	4/10/2002	TNT	2.1	0.7	µg/g			1
O10	3O10C	4/10/2002	RDX		0.8	µg/g			1
N9	3N9A	4/10/2002	TNT		0.7	µg/g			1
N9	3N9A	4/10/2002	RDX		0.8	µg/g			1
N9	3N9B	4/10/2002	TNT	1.1	0.7	µg/g			1
N9	3N9B	4/10/2002	RDX		0.8	µg/g			1
N9	3N9C	4/10/2002	TNT	1.0	0.7	µg/g			1
N9	3N9C	4/10/2002	RDX		0.8	µg/g			1
U9	2U9A	4/10/2002	TNT	21.1	0.7	µg/g			1
U9	2U9B	4/10/2002	TNT	7.3	0.7	µg/g			1
U9	2U9B	4/10/2002	RDX	1.9	0.8	µg/g			1
U9	2U9C	4/10/2002	TNT	5.2	0.7	µg/g			1
U9	2U9C	4/10/2002	RDX	2.5	0.8	µg/g			1
A9	3A9A	4/10/2002	TNT	1.5	0.7	µg/g			1
A9	3A9A	4/10/2002	RDX		0.8	µg/g			1
A9	3A9B	4/10/2002	TNT		0.7	µg/g			1
A9	3A9B	4/10/2002	RDX		0.8	µg/g			1
A9	3A9C	4/10/2002	TNT		0.7	µg/g			1
A9	3A9C	4/10/2002	RDX		0.8	µg/g			1
A7	3A7A	4/10/2002	TNT		0.7	µg/g			1
A7	3A7A	4/10/2002	RDX		0.8	µg/g			1
A7	3A7B	4/10/2002	TNT		0.7	µg/g			1
A7	3A7B	4/10/2002	RDX		0.8	µg/g			1
A7	3A7C	4/10/2002	TNT		0.7	µg/g			1
A7	3A7C	4/10/2002	RDX		0.8	µg/g			1
C9	3C9A	4/10/2002	TNT	1.4	0.7	µg/g			1
C9	3C9A	4/10/2002	RDX		0.8	µg/g			1
C9	3C9B	4/10/2002	TNT		0.7	µg/g			1
C9	3C9B	4/10/2002	RDX		0.8	µg/g			1
C9	3C9C	4/10/2002	TNT		0.7	µg/g			1
C9	3C9C	4/10/2002	RDX		0.8	µg/g			1
V5	3V5A	4/10/2002	TNT		0.7	µg/g			1
V5	3V5A	4/10/2002	RDX		0.8	µg/g			1
V5	3V5B	4/10/2002	TNT		0.7	µg/g			1
V5	3V5C	4/10/2002	TNT	1.6	0.7	µg/g			1
V7	3V7A	4/10/2002	TNT	29.9	0.7	µg/g			1
V10	4V10A	4/10/2002	TNT	1.4	0.7	µg/g			1
V10	4V10A	4/10/2002	RDX	6.0	0.8	µg/g			1
V7	3V7B	4/10/2002	TNT	14.2	0.7	µg/g			1
V7	3V7B	4/10/2002	RDX	175.6	0.8	µg/g	J	f	1
V7	3V7C	4/10/2002	TNT	15.8	0.7	µg/g			1
V7	3V7C	4/10/2002	RDX	216.4	0.8	µg/g			1
V10	4V10B	4/10/2002	TNT		0.7	µg/g			1
V10	4V10B	4/10/2002	RDX		0.8	µg/g			1
V10	4V10C	4/10/2002	TNT	0.7	0.7	µg/g			1
V10	4V10C	4/10/2002	RDX		0.8	µg/g			1
T10	4T10A	4/10/2002	TNT		0.7	µg/g			1
T10	4T10A	4/10/2002	RDX		0.8	µg/g			1
T10	4T10B	4/10/2002	TNT	1.2	0.7	µg/g			1

FIELD LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
T10	4T10B	4/10/2002	RDX		0.8	µg/g			1
T10	4T10C	4/10/2002	TNT	1.2	0.7	µg/g			1
T10	4T10C	4/10/2002	RDX		0.8	µg/g			1
X6	4X6A	4/10/2002	TNT		0.7	µg/g			1
X6	4X6A	4/10/2002	RDX		0.8	µg/g			1
X6	4X6B	4/10/2002	TNT		0.7	µg/g			1
X6	4X6B	4/10/2002	RDX		0.8	µg/g			1
X6	4X6C	4/10/2002	TNT		0.7	µg/g			1
X6	4X6C	4/10/2002	RDX		0.8	µg/g			1
U6	2U6A DL	4/10/2002	TNT	75.5	3.5	µg/g			5
U6	2U6B DL	4/10/2002	TNT	108.4	35	µg/g			50
R8	2R8A DL	4/8/2002	TNT	158.8	7	µg/g			10
T8	2T8C DL	4/8/2002	TNT	495.4	35	µg/g			50
T5	1T5A	4/8/2002	RDX	62.9	4	µg/g			5
B8	2B8A	4/8/2002	RDX	37	0.8	µg/g			1
M8	2M8A	4/8/2002	RDX	44.6	1.6	µg/g			2
R8	2R8A	4/11/2002	RDX	91.7	4	µg/g			5
R8	2R8B	4/9/2002	RDX	31.3	1.6	µg/g			2
T8	2T8A	4/9/2002	RDX	108.9	8	µg/g			10
U6	2U6A	4/10/2002	RDX	43.2	4	µg/g			5
V7	3V7A	4/10/2002	RDX	6.2	1.6	µg/g			2
V5	3V5B	4/10/2002	RDX		0.8	µg/g			1
V5	3V5C	4/10/2002	RDX		0.8	µg/g			1
U9	2U9A	4/10/2002	RDX	228.6	8	µg/g			10
P9	2P9B	4/10/2002	RDX	484.3	16	µg/g			20

FIELD LABORATORY QC RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
	Method Blank		TNT	0.9	0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	6.5	0.7	µg/g			1
	Laboratory Control		RDX	6.3	0.8	µg/g			1
C5	1C5A Dup	4/3/2002	TNT		0.7	µg/g			1
C5	1C5A Dup	4/3/2002	RDX		0.8	µg/g			1
E6	1E6CFD	4/3/2002	TNT		0.7	µg/g			1
E6	1E6CFD	4/3/2002	RDX		0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	9.2	0.7	µg/g			1
	Laboratory Control		RDX	5.7	0.8	µg/g			1
G8	1G8B Dup	4/3/2002	TNT	0.7	0.7	µg/g			1
G8	1G8B Dup	4/3/2002	RDX		0.8	µg/g			1
P3	1P3C FD	4/3/2002	TNT	2.0	0.7	µg/g			1
P3	1P3C FD	4/3/2002	RDX		0.8	µg/g			1
	Laboratory Control		RDX	9.3	0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	8.0	0.7	µg/g			1
	Laboratory Control		RDX	10.3	0.8	µg/g			1
H5	1H5C Dup	4/4/2002	TNT		0.7	µg/g			1
H5	1H5C Dup	4/4/2002	RDX		0.8	µg/g			1
H5	1H5C FD	4/4/2002	TNT	0.7	0.7	µg/g			1
H5	1H5C FD	4/4/2002	RDX		0.8	µg/g			1
N7	1N7C FD	4/4/2002	TNT	5.0	0.7	µg/g			1
N7	1N7C FD	4/4/2002	RDX	1.5	0.8	µg/g	J	I	1
S7	1S7C FD	4/4/2002	RDX	1.3	0.8	µg/g	J	I	1
S7	1S7C FD	4/4/2002	TNT	80.5	70	µg/g			100
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	5.7	0.7	µg/g			1
	Laboratory Control		RDX	8.4	0.8	µg/g			1
S4	1S4A Dup	4/4/2002	TNT		0.7	µg/g			1
S4	1S4A Dup	4/4/2002	RDX		0.8	µg/g			1
I8	1I8C FD	4/4/2002	TNT	5.2	0.7	µg/g			1
I8	1I8C FD	4/4/2002	RDX		0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	9.2	0.7	µg/g			1
	Laboratory Control		RDX	7.6	0.8	µg/g			1
K6	1K6C Dup	4/4/2002	TNT	2.1	0.7	µg/g			1
K6	1K6C Dup	4/4/2002	RDX		0.8	µg/g			1
K6	1K6C FD	4/4/2002	TNT	2.2	0.7	µg/g			1
K6	1K6C FD	4/4/2002	RDX		0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	9.6	0.7	µg/g			1
	Laboratory Control		RDX	8.4	0.8	µg/g			1

FIELD LABORATORY QC RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
T5	1T5A Dup	4/8/2002	TNT	1.7	0.7	µg/g			1
T5	1T5C FD	4/8/2002	TNT	6	0.7	µg/g			1
T5	1T5C FD	4/8/2002	RDX	0.85	0.8	µg/g			1
H4	1H4B FD	4/8/2002	TNT		0.7	µg/g			1
H4	1H4B FD	4/8/2002	RDX		0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	8.9	0.7	µg/g			1
	Laboratory Control		RDX	7.1	0.8	µg/g			1
N3	IN3A Dup	4/8/2002	TNT	1.8	0.7	µg/g			1
N3	IN3A Dup	4/8/2002	RDX		0.8	µg/g			1
J7	2J7B FD	4/8/2002	TNT	0.7	0.7	µg/g			1
J7	2J7B FD	4/8/2002	RDX	5.7	0.8	µg/g	J	f	1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	9.6	0.7	µg/g			1
	Laboratory Control		RDX	7.5	0.8	µg/g			1
M8	2M8B Dup	4/8/2002	TNT	0.7	0.7	µg/g			1
M8	2M8B Dup	4/8/2002	RDX	2.0	0.8	µg/g			1
T8	2T8C FD	4/8/2002	RDX	1.2	0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	9.3	0.7	µg/g			1
	Laboratory Control		RDX	7.2	0.8	µg/g			1
U4	2U4A Dup	4/10/2002	TNT	2.1	0.7	µg/g			1
U4	2U4A Dup	4/10/2002	RDX		0.8	µg/g			1
U4	2U4B FD	4/10/2002	TNT		0.7	µg/g			1
U4	2U4B FD	4/10/2002	RDX		0.8	µg/g			1
O10	3O10B FD	4/10/2002	TNT		0.7	µg/g			1
O10	3O10B FD	4/10/2002	RDX		0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	9.3	0.7	µg/g			1
	Laboratory Control		RDX	6.0	0.8	µg/g			1
U9	2U9A Dup	4/10/2002	TNT	21.1	0.7	µg/g			1
A9	3A9A FD	4/10/2002	TNT	1.5	0.7	µg/g			1
A9	3A9A FD	4/10/2002	RDX		0.8	µg/g			1
O10	3O10B FD	4/10/2002	RDX		0.8	µg/g			1
	Method Blank		TNT		0.7	µg/g			1
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		TNT	8.9	0.7	µg/g			1
	Laboratory Control		RDX	7.7	0.8	µg/g			1
V10	4V10A DUP	4/10/2002	TNT	1.1	0.7	µg/g			1
V10	4V10A DUP	4/10/2002	RDX	7.3	0.8	µg/g			1
V7	3V7B FD	4/10/2002	TNT	12.6	0.7	µg/g			1
X6	4X6B FD	4/10/2002	TNT		0.7	µg/g			1
X6	4X6B FD	4/10/2002	RDX		0.8	µg/g			1
T8	2T8C FD DL	4/8/2002	TNT	498.5	35	µg/g			50
	Method Blank		RDX		0.8	µg/g			1
	Laboratory Control		RDX	7.4	0.8	µg/g			1

FIELD LABORATORY QC RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
T5	1T5A Dup	4/8/2002	RDX	75.3	4	µg/g			5
R8	2R8A FD	4/8/2002	RDX	82.7	4	µg/g			5
U9	2U9A Dup	4/10/2002	RDX	262.5	8	µg/g			10
R8	2R8A FD DL	4/8/2002	TNT	156.3	7	µg/g			10
V7	3V7B FD	4/10/2002	RDX	62.9	4	µg/g	J	f	5

FIELD LABORATORY DILUTION RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
C7	1C7A	4/3/2002	RDX	197.6	0.8	µg/g			1
P7	1P7B	4/3/2002	TNT	125.1	0.7	µg/g			1
P7	1P7C	4/3/2002	TNT	130.8	0.7	µg/g			1
P7	1P7C	4/3/2002	RDX	171.3	0.8	µg/g			1
Q6	1Q6A	4/3/2002	RDX	132.9	0.8	µg/g			1
Q6	1Q6B	4/3/2002	TNT	120.5	0.7	µg/g			1
Q6	1Q6C	4/3/2002	RDX	207.8	0.8	µg/g			1
Q6	1Q6C DL	4/3/2002	TNT	22.6	7	µg/g			10
Q6	1Q6C DL	4/3/2002	RDX	721.9	8	µg/g			10
Q6	1Q6B DL	4/3/2002	TNT	5967.5	35	µg/g			50
P7	1P7C DL	4/3/2002	RDX	390.4	8	µg/g			10
P7	1P7B DL	4/3/2002	TNT	526.3	350	µg/g			500
N7	1N7A	4/4/2002	RDX	55.9	0.8	µg/g	J	l	1
N7	1N7B	4/4/2002	TNT	133.3	0.7	µg/g			1
Q8	1Q8A	4/4/2002	RDX	77.4	0.8	µg/g	J	l	1
Q8	1Q8B	4/4/2002	TNT	114.8	0.7	µg/g			1
Q8	1Q8B	4/4/2002	RDX	216.3	0.8	µg/g	J	l	1
Q8	1Q8C	4/4/2002	RDX	122.0	0.8	µg/g	J	l	1
R5	1R5A	4/4/2002	RDX	168.9	0.8	µg/g	J	l	1
S7	1S7C	4/4/2002	TNT	121.6	0.7	µg/g			1
N7	1N7B	4/4/2002	TNT	92.9	350	µg/g			500
S7	1S7A	4/4/2002	RDX	89.4	0.8	µg/g	J	l	1
S7	1S7B	4/4/2002	TNT	126.3	0.7	µg/g			1
K6	1K6A	4/4/2002	RDX	129.9	0.8	µg/g	J	l	1
S7	1S7B	4/4/2002	TNT	1517.0	35	µg/g			50
Q8	1Q8B	4/4/2002	RDX	1019.1	16	µg/g	J	l	20
T5	1T5A	4/8/2002	RDX	184.2	0.8	µg/g			1
B8	2B8A	4/8/2002	RDX	27	1.6	µg/g			2
M8	2M8A	4/8/2002	RDX	57.4	0.8	µg/g			1
R8	2R8A	4/8/2002	TNT	101.7	0.7	µg/g			1
R8	2R8A	4/8/2002	RDX	142.1	0.8	µg/g			1
R8	2R8B	4/8/2002	RDX	49.3	0.8	µg/g			1
P9	2P9B	4/8/2002	RDX	215.3	0.8	µg/g			1
T8	2T8A	4/8/2002	RDX	101.6	0.8	µg/g			1
T8	2T8C	4/8/2002	TNT	99.0	0.7	µg/g			1
T5	1T5B DIL	4/8/2002	RDX	6.0	1.6	µg/g			2
U6	2U6A	4/10/2002	TNT	32.0	0.7	µg/g			1
U6	2U6A	4/10/2002	RDX	45.2	0.8	µg/g			1
U6	2U6B	4/10/2002	TNT	78.9	0.7	µg/g			1
R8	2R8A DL	4/8/2002	TNT	153.6	3.5	µg/g			5
T8	2T8C DL	4/8/2002	TNT	444.6	3.5	µg/g			5
U9	2U9A	4/10/2002	RDX	217.4	0.8	µg/g			1
V7	3V7B	4/10/2002	RDX	38.7	4	µg/g	J	f	5
V7	3V7C	4/10/2002	RDX	49.1	8	µg/g			10
P9	2P9B	4/9/2002	RDX	434.0	8	µg/g			10

FIELD LABORATORY QC DILUTION RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Location	Sample ID	Sample Date	Parameter	Amount	RL	Unit	DV Flags	Reason Code	Dilution Factor
S7	1S7C FD	4/4/2002	TNT	121.6	0.7	µg/g			1
T5	1T5A Dup	4/8/2002	RDX	137.7	0.8	µg/g			1
R8	2R8A FD	4/8/2002	TNT	104.6	0.7	µg/g			1
R8	2R8A FD	4/8/2002	RDX	140.3	0.8	µg/g			1
T8	2T8C FD	4/8/2002	TNT	97.2	0.7	µg/g			1
U9	2U9A Dup	4/10/2002	RDX	132.4	0.8	µg/g			1
T8	2T8C FD DL	4/8/2002	TNT	479.4	3.5	µg/g			5
V7	3V7B FD	4/10/2002	RDX	73.2	0.8	µg/g	J	f	1
R8	2R8A FD DL	4/8/2002	TNT	233.9	3.5	µg/g			5

DATACHEM LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	1E6CLA	03-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	HMX		0.616	0.20	UG/G				1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	RDX	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1E6CLA	03-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00690
CSO	1H4BLA	08-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	HMX		0.243	0.20	UG/G		√	J, g	1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	RDX		0.211	0.20	UG/G		√	J,g	1	TEAD04	02C00734
CSO	1H4BLA	08-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00734
CSO	1H5CLA	04-APR-2002	EXP	1,3,5-TRINITROBENZENE		0.423	0.10	UG/G				1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	HMX		0.207	0.20	UG/G				1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700

DATACHEM LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	1H5CLA	04-APR-2002	EXP	RDX	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1H5CLA	04-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00700
CSO	1I8CLA	04-APR-2002	EXP	1,3,5-TRINITROBENZENE		5.90	0.10	UG/G				1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE		0.846	0.20	UG/G				1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	2,4-DINITROTOLUENE	TR	0.166	0.20	UG/G	J			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	HMX		0.559	0.20	UG/G				1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	RDX		0.597	0.20	UG/G				1	TEAD03	02C00701
CSO	1I8CLA	04-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00701
CSO	1K6CLA	04-APR-2002	EXP	1,3,5-TRINITROBENZENE		2.89	0.10	UG/G				1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE		0.940	0.20	UG/G				1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	HMX		0.535	0.20	UG/G				1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	RDX		2.20	0.20	UG/G				1	TEAD03	02C00702
CSO	1K6CLA	04-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00702
CSO	1N7CLA	04-APR-2002	EXP	1,3,5-TRINITROBENZENE		9.40	0.10	UG/G				1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE		1.90	0.20	UG/G				1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00703

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Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	1N7CLA	04-APR-2002	EXP	HMX		1.23	0.20	UG/G				1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	RDX		3.70	0.20	UG/G				1	TEAD03	02C00703
CSO	1N7CLA	04-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00703
CSO	1P3CLA	03-APR-2002	EXP	1,3,5-TRINITROBENZENE		1.30	0.10	UG/G				1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	2,4,6-TRINITROTOLUENE		0.228	0.20	UG/G				1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	HMX		0.215	0.20	UG/G				1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	RDX	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1P3CLA	03-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD02	02C00691
CSO	1S7CLA	04-APR-2002	EXP	1,3,5-TRINITROBENZENE		25.9	0.10	UG/G				1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE		93.1	0.20	UG/G				1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE		0.769	0.20	UG/G				1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE		6.32	0.20	UG/G				1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	HMX		0.579	0.20	UG/G				1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	RDX		2.19	0.20	UG/G				1	TEAD03	02C00704
CSO	1S7CLA	04-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00704
CSO	1T5CLA	08-APR-2002	EXP	1,3,5-TRINITROBENZENE		4.97	0.10	UG/G		√	J, g	1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE		0.869	0.20	UG/G		√	J, g	1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	2,4-DINITROTOLUENE	TR	0.148	0.20	UG/G	J	√	J, g	1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	2,6-DINITROTOLUENE	TR	0.177	0.20	UG/G	J	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00733

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Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	1T5CLA	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	HMX		0.379	0.20	UG/G		√	J,g	1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	RDX		1.05	0.20	UG/G		√	J,g	1	TEAD04	02C00733
CSO	1T5CLA	08-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00733
CSO	2J7BLA	08-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	HMX		1.63	0.20	UG/G		√	J,g	1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	RDX		20.5	0.20	UG/G		√		1	TEAD04	02C00735
CSO	2J7BLA	08-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00735
CSO	2R8ALA	08-APR-2002	EXP	1,3,5-TRINITROBENZENE		8.44	0.10	UG/G		√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U	√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE		170	1.00	UG/G		√		5	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	2,4-DINITROTOLUENE	TR	0.155	0.20	UG/G	J	√	J,g	1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE		0.750	0.20	UG/G		√	J,g	1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE		0.678	0.20	UG/G		√	J,g	1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	HMX		32.0	0.20	UG/G		√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	RDX		522	1.00	UG/G		√		5	TEAD04	02C00736
CSO	2R8ALA	08-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U	√		1	TEAD04	02C00736
CSO	2T8CLA	08-APR-2002	EXP	1,3,5-TRINITROBENZENE		14.7	0.10	UG/G		√	J,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE		370	1.00	UG/G		√	J,s	5	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	TR	0.190	0.20	UG/G	J	√	J,s	1	TEAD04	02C00737

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Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	2T8CLA	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	HMX		0.543	0.20	UG/G		√	J,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	RDX		2.23	0.20	UG/G		√	J,s	1	TEAD04	02C00737
CSO	2T8CLA	08-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00737
CSO	2U4BLA	10-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	HMX		0.517	0.20	UG/G				1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	RDX	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00787
CSO	2U4BLA	10-APR-2002	MISC	MOISTURE		8.6		%				1	TEAD05	02C00787
CSO	3A9ALA	10-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	TR	0.0747	0.20	UG/G	J			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	HMX	TR	0.184	0.20	UG/G	J			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	RDX	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00789
CSO	3A9ALA	10-APR-2002	MISC	MOISTURE		5.2		%				1	TEAD05	02C00789
CSO	3O10BLA	10-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00788

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Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	3O10BLA	10-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	HMX	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	RDX	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00788
CSO	3O10BLA	10-APR-2002	MISC	MOISTURE		7.8		%				1	TEAD05	02C00788
CSO	3V7BLA	10-APR-2002	EXP	1,3,5-TRINITROBENZENE		10.5	0.10	UG/G				1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	1,3-DINITROBENZENE		0.252	0.10	UG/G				1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	2,4,6-TRINITROTOLUENE		3.84	0.20	UG/G				1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	2,4-DINITROTOLUENE	TR	0.109	0.20	UG/G	J			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	2,6-DINITROTOLUENE	TR	0.124	0.20	UG/G	J			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	TR	0.130	0.20	UG/G	J			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	HMX		4.81	0.20	UG/G				1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	RDX		203	1.00	UG/G				5	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00790
CSO	3V7BLA	10-APR-2002	MISC	MOISTURE		6.9		%				1	TEAD05	02C00790
CSO	4X6BLA	10-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	1,3-DINITROBENZENE	TR	0.0617	0.10	UG/G	J			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	HMX	TR	0.185	0.20	UG/G	J			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791

DATACHEM LABORATORY RESULTS
TNT WASHOUT FACILITY (SWMU 10)

Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	4X6BLA	10-APR-2002	EXP	RDX	TR	0.164	0.20	UG/G	J			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD05	02C00791
CSO	4X6BLA	10-APR-2002	MISC	MOISTURE		8.1		%				1	TEAD05	02C00791

(a) Data results validated by URS have checkmark in the Validation Data column.

DATACHEM LABORATORY QC RESULTS
TNT WASHOUT FACILITY (SMWU 10)

Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CQC	SOURCE 1	03-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.13	0.13	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	2-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	3-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	4-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	HMX	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	NITROBENZENE	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	RDX	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	SOURCE 1	03-APR-2002	EXP	TETRYL	ND	0.26	0.26	UG/L	U			1	TEAD01	02C00689
CQC	1EB	04-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.13	0.13	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	HMX	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	NITROBENZENE	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	RDX	TR	0.229	0.26	UG/L	J			1	TEAD03	02C00699
CQC	1EB	04-APR-2002	EXP	TETRYL	ND	0.26	0.26	UG/L	U			1	TEAD03	02C00699

DATACHEM LABORATORY QC RESULTS
TNT WASHOUT FACILITY (SMWU 10)

Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CQC	2EB	08-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE	TR	0.0954	0.26	UG/L	J			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.13	0.13	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	HMX	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	NITROBENZENE	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	RDX	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	2EB	08-APR-2002	EXP	TETRYL	ND	0.26	0.26	UG/L	U			1	TEAD04	02C00732
CQC	3EB	10-APR-2002	EXP	1,3,5-TRINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.13	0.13	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	2,4,6-TRINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.13	0.13	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	2-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	3-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	4-NITROTOLUENE	ND	0.52	0.52	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	HMX	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	NITROBENZENE	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	RDX	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793
CQC	3EB	10-APR-2002	EXP	TETRYL	ND	0.26	0.26	UG/L	U			1	TEAD05	02C00793

DATACHEM LABORATORY QC RESULTS
TNT WASHOUT FACILITY (SMWU 10)

Sample Matrix	SAMPLE ID	Sample Date	Para-meter	Analytical Name	MB	Amount	PQL	Units	Lab Flag	Valid. Data (a)	Valid. Flags (a)	Dilu-tion	SDG	Laboratory Sample ID
CSO	1S7CLD	04-APR-2002	EXP	1,3,5-TRINITROBENZENE		12.8	0.10	UG/G				1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	2,4,6-TRINITROTOLUENE		68.0	0.20	UG/G				1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	2,4-DINITROTOLUENE		0.200	0.20	UG/G	J			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	TR	0.152	0.20	UG/G	J			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE		3.49	0.20	UG/G				1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	HMX		0.349	0.20	UG/G				1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	RDX		1.13	0.20	UG/G				1	TEAD03	02C00705
CSO	1S7CLD	04-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U			1	TEAD03	02C00705
CSO	2T8CLD	08-APR-2002	EXP	1,3,5-TRINITROBENZENE		15.0	0.10	UG/G		√	J,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	1,3-DINITROBENZENE	ND	0.10	0.10	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	2,4,6-TRINITROTOLUENE		371	1.00	UG/G		√	J,s	5	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	2,4-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	2-AMINO-4,6-DINITROTOLUENE	TR	0.157	0.20	UG/G	J	√	J,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	2-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	3-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	4-AMINO-2,6-DINITROTOLUENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	4-NITROTOLUENE	ND	0.40	0.40	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	HMX		0.566	0.20	UG/G		√	J,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	NITROBENZENE	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	RDX		3.30	0.20	UG/G		√	J,s	1	TEAD04	02C00738
CSO	2T8CLD	08-APR-2002	EXP	TETRYL	ND	0.20	0.20	UG/G	U	√	uJ,s	1	TEAD04	02C00738

(a) Data results validated by URS have checkmark in the Validation Data column.

ATTACHMENT D
Data Quality Assessment

- TNT and RDX Dilution Analysis
- Field Laboratory Data Validation Reports
- DataChem Laboratory Data Validation Report

TNT and RDX Dilution Analysis – SWMU10
Tooele Army Deport – UT

4/4/02

2,4,6-TNT results in samples 1P7B, 1P7C, and 1Q6B; and RDX results in samples 1C7A, 1P7C, 1Q6A, and 1Q6C exceeded the test kit specified linear range (30 mg/kg). These 2,4,6-TNT and RDX results were flagged "J,q". Samples 1Q6C and 1P7C were originally diluted by a factor of 10 and reanalyzed for RDX by the field laboratory. Sample 1Q6B was originally diluted by a factor of 50 and reanalyzed for 2,4,6-TNT. These RDX and 2,4,6-TNT results from re-analysis still exceeded the linear range. These 2,4,6-TNT and RDX results were also flagged "J,q". These samples were diluted by factors of 20 (1P7C), 50 (1Q6C), and 500 (1Q6B), re-analyzed again, and results were within the linear range. These more highly diluted results should be used for data interpretation. Samples 1Q6A and 1C7A were diluted by factors of 5 (1Q6A) and 10 (1C7A) and re-analyzed for RDX, and, results were within the linear range. These diluted RDX results should be used for data interpretation. Samples 1P7B and 1P7C were diluted by a factor of 500 and re-analyzed for TNT, and, results were within the linear range. These diluted TNT results should be used for data interpretation. The TNT result in sample 1Q6C was slightly less than the test kit specified linear range at 28 mg/kg. This sample was diluted by a factor of 10 and re-analyzed to verify original TNT result (at 22.6 mg/kg). Since the original TNT result was higher than the diluted result and did not exceed the linear range, the original TNT result in sample 1Q6C should be used for data interpretation.

4/5/02

2,4,6-TNT results in samples 1N7B, 1Q8B, 1S7C, and 1S7B; and RDX results in samples 1N7A, 1Q8A, 1Q8B, 1Q8C, 1R5A, 1S7A, and 1K6A exceeded the test kit specified linear range (30 mg/kg). These 2,4,6-TNT and RDX results were flagged "J,q". Samples 1N7B (dilution factor of 500) and 1S7B (dilution factor of 50) were originally diluted and reanalyzed for TNT by the field laboratory. Sample 1Q8B was originally diluted by a factor of 20 and reanalyzed for RDX. The RDX and 2,4,6-TNT results from re-analysis indicated that the TNT result in sample 1N7B was over-diluted and other TNT and RDX results still exceeded the linear range. These 2,4,6-TNT and RDX results were also flagged "J,q". The samples were diluted by factors of 50 (1N7B), 100 (1S7B), and 50 (1Q8B), (re-analyzed) and results were within the linear range. These final results should be used for data interpretation. Samples 1Q8B and 1S7C were diluted by a factor of 100 and re-analyzed for TNT with results that were within the linear range. Those TNT results should be used for data interpretation. Samples 1N7A, 1Q8A, 1Q8C, and 1R5A were diluted by factors of 2 (1N7A), 5 (1Q8A and 1Q8C), and 10 (1R5A) and re-analyzed for RDX; and results were within the linear range. Those final RDX results should be used for data interpretation.

4/8/02

RDX results in samples 1T5A, 1T5B, 2B8A, and 2M8A exceeded the test kit specified linear range (30 mg/kg). These RDX results were flagged "J,q". Sample 1T5B was diluted by a factor of 2 and reanalyzed for RDX by the field laboratory. The diluted RDX result was much less than the original result at 6.0 mg/kg (original result is 30.1 mg/kg). Therefore, the original RDX result in sample 1T5B should be used for data interpretation. Samples 1T5A, 2B8A, and 2M8A were re-extracted and re-analyzed for RDX with dilutions on 4/11/02. Re-analyzed RDX results in samples 1T5A and 2M8A should be used for data interpretation. Since the RDX result in sample 2B8A from the re-analysis was slightly less than the cleanup criteria (31 mg/kg) at 27 mg/kg, in order to be conservative it is recommended that the original RDX result (37 mg/kg) in sample 2B8A should be used for data interpretation.

4/9/02

2,4,6-TNT results in samples 2R8A and 2T8C; and RDX results in samples 2R8A, 2R8B, 2P9B, and 2T8A exceeded the test kit specified linear range (30 mg/kg). These 2,4,6-TNT and RDX results were flagged "J, q". Samples 2R8A and 2T8C were originally diluted by a factor of 5 and reanalyzed for TNT on 4/10/02. TNT results from the re-analysis still exceeded the linear range. These diluted TNT results were also flagged "J,q". These samples were diluted by factor of 10 (2R8A) and 50 (2T8C), re-analyzed again, with results within the linear range. TNT results from second dilution analysis should be used for data interpretation. Sample 2P9B was originally diluted by a factor of 10 and reanalyzed for RDX on 4/11/02. The RDX result from the re-analysis still exceeded the linear range. This diluted RDX result was also flagged "J,q". This sample was diluted by a factor of 20, re-analyzed again, with results within the linear range. The RDX result from the second dilution should be used for data interpretation. Samples 2R8A, 2R8B, and 2T8A were diluted by factors of 2 (2R8B), 5 (2R8A), and 10 (2T8A) and reanalyzed on 4/11/02. Re-analyzed RDX results from the dilution analysis should be used for data interpretation.

4/10/02

2,4,6-TNT results in samples 2U6A and 2U6B; and RDX results in samples 2U6A and 2U9A exceeded the test kit specified linear range (30 mg/kg). These 2,4,6-TNT and RDX results were flagged "J,q". These samples were diluted and reanalyzed on 4/11/02. TNT and RDX results from the dilution analysis should be used for data interpretation.

4/11/02

RDX results in samples 3V7B and 3V7C exceeded the test kit specified linear range (30 mg/kg). These RDX results were flagged "J,q". These two samples were re-extracted at reduced sample volume (2 gram) and re-analyzed by the field laboratory. RDX results from the re-analysis were much less than the original analysis. The original RDX results are recommended for data interpretation.

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/4/02____________ **Fraction:__TNT & RDX______________**

Lab:_____Field Lab__________ **Project Name:__Tooele________________**

Reviewer:____RA_____________ **Date:____April 16, 2002________________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: None.

Correctable Anomalies: None.

Comments: It should be noted that some LCS absorbances were less than the lower control limit specified in the method for TNT and RDX. The manufacturer, SDI, was contacted and required to conduct a stability study using the same TNT and RDX standards used in the field. The study indicated that the standard shipped to the field was degraded. URS then required SDI to re-certify the standard. Four replicate analyses were performed, under controlled conditions, of the standard lots in question. The average absorbance +/- 3 X STDEV was used to establish new control limits for the LCS analyses. All absorbances were within the newly established window.

Signed: Ranjan

Jason Ai
URS Corp.
849 International Drive, Suite 320
Linthicum, MD 21090

Strategic Diagnostics Incorporated
111 Pencader Drive
Newark, DE 19702

Dear Jason,

Thank you for using our Ensys TNT and RDX test kits on your Tooele Project. We truly appreciate doing business with URS, and your office in particular. The Ensys TNT and RDX test kits passed our internal QC and are functioning properly. SDI has recently run both the Ensys TNT and RDX test kits for the lots that you are using and shown that the QA/QC standards are resulting in absorbance values lower than indicated in the User's Guide.

The absorbances that SDI has obtained using a Hach DR2010 for the TNT and RDX standards are:

TNT:	RDX:
0.291	0.171
0.290	0.150
0.265	0.151
0.270	0.141

Based upon the the absorbance values that SDI has provided you, your calculations for the upper control limit and lower control limit for the test kits are correct.

Sincerely,

Rich Quashne
Southeastern Account Manager
Strategic Diagnostics, Inc.
(800) 544-8881 x244
(302) 456-6782 (Fax)
rquashne@sdix.com

Extraction Log - TNT and RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Extraction Date: 4/4/02 Extraction Kit ID: 1K1125 10/02

Batch Number: A Analyst Initial: JA

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01	NA	50 ml	Clear	Laboratory QC sample
2	**Laboratory Control**	A-02	NA	50 ml	Clear	Laboratory QC sample
3	1C5A	A-03	10.041	50 ml	Clear	4/3/02 8:55
4	1C5A Dup	A-04	10.064	50 ml	Clear	Lab Dup.
5	1C5B	A-05	10.062	50 ml	Clear	4/3/02 8:57
6	1C5C	A-06	10.066	50 ml	Clear	4/3/02 9:03
7	1C7A	A-07	10.028	50 ml	L. Yellow	4/3/02 9:20
8	1C7B	A-08	10.026	50 ml	Clear	4/3/02 9:22
9	1C7C	A-09	10.058	50 ml	Clear	4/3/02 9:25
10	1E6A	A-10	10.025	50 ml	Clear	4/3/02 9:40
11	1E6B	A-11	10.022	50 ml	Clear	4/3/02 9:42
12	1E6C	A-12	10.034	50 ml	Clear	4/3/02 9:45
13	1E9A	A-13	10.052	50 ml	Clear	4/3/02 10:10
14	1E9B	A-14	10.020	50 ml	Clear	4/3/02 10:12
15	1E9C	A-15	10.021	50 ml	Clear	4/3/02 10:15
16	1G6A	A-16	10.079	50 ml	Clear	4/3/02 10:30
17	1G6B	A-17	10.039	50 ml	Clear	4/3/02 10:32
18	1G6C	A-18	10.049	50 ml	Orange	4/3/02 10:35
19	1G8A	A-19	10.021	50 ml	Clear	4/3/02 11:00
20	1E6CFD	A-20	10.042	50 ml	Clear	4/3/02 9:45

Note/Comment:

QA officer Review/Initial: Date: 4/16/02

Laboratory Manager Review/Initial: Date: 4/16/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/4/02	TNT Test Kit ID:	7002000 1E1165 5/03
Batch Number:	A	Analyst Initial:	JA
Wavelength Used:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.000	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	-0.002	0.020	0.9	**0.9**	Light Yellow
2	**Laboratory Control**	A-02	0.011	0.255	6.5	**6.5**	
3	1C5A	A-03	-0.001	0.005	0.3	0.7 U	
4	1C5A Dup	A-04	-0.002	0.005	0.4	0.7 U	Lab Dup.
5	1C5B	A-05	-0.002	0.003	0.3	0.7 U	
6	1C5C	A-06	-0.002	0.021	0.9	**0.9**	Light Pink
7	1C7A	A-07	0.013	0.212	5.0	**5.0**	Pink
8	1C7B	A-08	-0.001	0.003	0.2	0.7 U	Re-zero the instrument
9	1C7C	A-09	-0.002	0.003	0.3	0.7 U	
10	1E6A	A-10	0.000	0.006	0.2	0.7 U	Re-zero the instrument
11	1E6B	A-11	-0.001	0.003	0.2	0.7 U	
12	1E6C	A-12	-0.001	0.008	0.4	0.7 U	
13	1E9A	A-13	0.004	0.059	1.3	**1.3**	Light Pink
14	1E9B	A-14	0.001	0.016	0.4	0.7 U	
15	1E9C	A-15	0.002	0.033	0.8	**0.8**	Light Orange
16	1G6A	A-16	0.002	0.026	0.6	0.7 U	Light Orange
17	1G6B	A-17	-0.001	0.004	0.2	0.7 U	
18	1G6C	A-18	0.000	0.020	0.6	0.7 U	
19	1G8A	A-19	0.000	0.006	0.2	0.7 U	
20	1E6CFD	A-20	-0.001	0.007	0.3	0.7 U	

Notes: 1) Abs for lab control sample must be between 0.239 to 0.319 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

* Method blank has light yellow color. Not TNT contamination. This method blank was rerun and no contamination was found. ($Abs_{initial}$ = 0.003 and Abs_{sample}=0.003; TNT conc.= 0.7U)

** Control sample was rerun and displayed a similar result (Abs_{sample}=0.272)

QA officer Review/Initial: [signature] Date: 4/16/02
Laboratory Manager Review/Ini: [signature] Date: 4/16/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/4/02	RDX Test Kit ID:	7085000 1K1125 10/02
Batch Number:	A	Analyst Initial:	MS
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	-0.001	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.003	-0.3	0.8 U	
2	**Laboratory Control**	A-02	0.062	6.3	**6.3**	
3	1C5A	A-03	0.004	-0.2	0.8 U	
4	1C5A Dup	A-04	0.003	-0.3	0.8 U	Lab. Dup.
5	1C5B	A-05	0.004	-0.2	0.8 U	
6	1C5C	A-06	0.004	-0.2	0.8 U	
7	1C7A	A-07	1.764	197.6	**197.6**	dark pink. Need 10x dilution
8	1C7B	A-08	0.003	-0.3	0.8 U	
9	1C7C	A-09	0.027	2.4	**2.4**	
10	1E6A	A-10	0.006	0.1	0.8 U	
11	1E6B	A-11	0.004	-0.2	0.8 U	
12	1E6C	A-12	0.004	-0.2	0.8 U	
13	1E9A	A-13	0.121	13.0	**13.0**	pink color.
14	1E9B	A-14	0.012	0.7	0.8 U	
15	1E9C	A-15	0.008	0.3	0.8 U	
16	1G6A	A-16	0.003	-0.3	0.8 U	
17	1G6B	A-17	0.004	-0.2	0.8 U	
18	1G6C	A-18	0.011	0.6	0.8 U	
19	1G8A	A-19	0.003	-0.3	0.8 U	
20	1E6CFD	A-20	0.004	-0.2	0.8 U	

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

Dilution result for 1C7A was in batch B.

QA officer Review/Initial: [signature] Date: 4/16/02

Lab. Manager Review/Initial: [signature] Date: 4/16/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/4/02 Extraction Kit ID: ______

Batch Number: B Analyst Initial: JA

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01	-	50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02	-	50 ml		Laboratory QC sample
3	1G8B	B-03	10.027	50 ml		4/3/02 11:02
4	1G8B Dup	B-04	10.041	50 ml		Lab Dup.
5	1G8C	B-05	10.060	50 ml	light yellow	4/3/02 11:04
6	1P3A	B-06	10.068	50 ml	light yellow	4/3/02 14:35
7	1P3B	B-07	10.046	50 ml		4/3/02 14:38
8	1P3C	B-08	10.032	50 ml		4/3/02 14:42
9	1P7A	B-09	10.023	50 ml	light yellow	4/3/02 15:05
10	1P7B	B-10	10.047	50 ml	brown/orange	4/3/02 15:07
11	1P7C	B-11	10.008	50 ml	yellow/brown	4/3/02 15:11
12	1Q4A	B-12	10.045	50 ml		4/3/02 15:45
13	1Q4B	B-13	10.073	50 ml	light yellow	4/3/02 15:47
14	1Q4C	B-14	10.05	50 ml		4/3/02 15:52
15	1P3C FD	B-15	10.053	50 ml		4/3/02 0:00
16	1Q6A	B-16	10.075	50 ml	yellow/brown	4/3/02 18:25
17	1Q6B	B-17	10.05	50 ml	brown/orange	4/3/02 18:27
18	1Q6C	B-18	10.022	50 ml	brown/orange	4/3/02 18:32
19	1H5A	B-19	10.056	50 ml		4/4/02 7:50
20	1H5B	B-20	10.038	50 ml		4/4/02 7:52

Note/Comment:

QA officer Review/Initial: [signature] Date: 4/16/02

Laboratory Manager Review/Ini [signature] Date: 4/16/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date: 4/4/02
Batch Number: B
Wavelength Used: 540 nm
$Abs_{background}$: 0.001

TNT Test Kit ID: 1E1165 exp. 5/03
Analyst Initial: JA
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.001	0.002	-0.1	0.7 U	
2	**Laboratory Control**	B-02	0.004	0.314	9.2	**9.2**	
3	1G8B	B-03	0.005	0.021	0.0	0.7 U	light pink
4	1G8B Dup	B-04	0.000	0.021	0.7	0.7	Lab. Dup. Light pink
5	1G8C	B-05	0.004	0.172	4.8	**4.8**	pink
6	1P3A	B-06	0.007	0.092	2.0	**2.0**	light pink
7	1P3B	B-07	-0.002	0.002	0.3	0.7 U	
8	1P3C	B-08	0.000	0.054	1.7	**1.7**	light pink
9	1P7A	B-09	0.005	0.094	2.3	**2.3**	light pink
10	1P7B	B-10	0.115	4.5	125.1	**125.1**	dark red - See re-run
11	1P7C	B-11	0.069	4.5	130.8	**130.8**	dark red/black - see rerun
12	1Q4A	B-12	-0.002	0.014	0.7	0.7	
13	1Q4B	B-13	0.005	0.064	1.4	**1.4**	light pink
14	1Q4C	B-14	0.001	0.055	1.6	**1.6**	light pink
15	1P3C FD	B-15	-0.001	0.06	2.0	**2.0**	light pink
16	1Q6A	B-16	0.028	0.364	7.8	**7.8**	pink
17	1Q6B	B-17	0.152	4.5	120.5	**120.5**	dark red - See re-run
18	1Q6C	B-18	0.075	1.203	28.0	**28.0**	dark red - See re-run
19	1H5A	B-19	-0.001	0.009	0.4	0.7 U	
20	1H5B	B-20	-0.001	0.007	0.3	0.7 U	
21	1Q6C DL	B-18 DL	0.02	0.153	22.6	**22.6**	10x dilution
22	1Q6B DL	B-17 DL	0.009	3.891	5967.5	**5967.5**	50x dilution rerun at 500x dil.
23	1Q6B DL	B-17 DL	0.003	0.492	7430.3	**7430.3**	500x dilution
24	1P7B DL	B-10 DL	0.003	0.055	665.6	**665.6**	see rerun
25	1P7C DL	B-11 DL	0.004	0.209	2987.6	**2987.6**	500x dilution
26	1P7B DL	B-10 DL	0.005	0.054	526.3	**526.3**	500x dilution

Notes: 1) Abs for lab control sample must be between 0.239 to 0.319 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: Date: 4/16/02
Laboratory Manager Review: Date: 4/16/02

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date:	4/4/02	RDX Test Kit ID:	7085000 1K1125 10/02
Batch Number:	B	Analyst Initial:	MS
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	-0.001	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.001	-0.5	0.8 U	
2	**Laboratory Control**	B-02	0.056	5.7	**5.7**	
3	1G8B	B-03	0.002	-0.4	0.8 U	
4	1G8B Dup	B-04	0.002	-0.4	0.8 U	Lab. Dup.
5	1G8C	B-05	0.003	-0.3	0.8 U	
6	1P3A	B-06	0.001	-0.5	0.8 U	
7	1P3B	B-07	0.002	-0.4	0.8 U	
8	1P3C	B-08	0.002	-0.4	0.8 U	
9	1P7A	B-09	0.218	23.9	**23.9**	pink color
10	1P7B	B-10	0.054	5.4	**5.4**	pale yellow color
11	1P7C	B-11	1.53	171.3	**171.3**	dark red/yellow color. Need 10x dil.
12	1Q4A	B-12	0.002	-0.4	0.8 U	
13	1Q4B	B-13	0.002	-0.4	0.8 U	
14	1Q4C	B-14	0.001	-0.5	0.8 U	
15	1P3C FD	B-15	0.002	-0.4	0.8 U	
16	1Q6A	B-16	1.188	132.9	**132.9**	bubblegum pink color. Need 5x dil.
17	1Q6B	B-17	0.13	14.0	**14.0**	brown/yellow color
18	1Q6C	B-18	1.855	207.8	**207.8**	dark bubblegum pink color. Need 10x dil.
19	1H5A	B-19	0.002	-0.4	0.8 U	
20	1H5B	B-20	0.001	-0.5	0.8 U	
21	1C7A DL	A-7 DL	0.139	150.0	**150.0**	10x dilution
22	1P7C DL	B-11 DL	0.353	390.4	**390.4**	10x dilution
23	1Q6A DL	B-16 DL	0.235	128.9	**128.9**	5x dilution
24	1Q6C DL	B-18 DL	0.648	721.9	**721.9**	10x dilution
25	1P7C DL	B-11 DL	0.180	392.1	**392.1**	20x dilution
26	1Q6C DL	B-18 DL	0.090	474.7	**474.7**	50x dilution
27	Laboratory Control	B-22	0.088	9.3	**9.3**	re-run, confirmation

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/16/02

Lab. Manager Review/Initial: [signature] Date: 4/16/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/4/02 Extraction Kit ID: 7185000 1K1175 10/02

Batch Number: A Analyst Initial: JA

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	Method Blank	A-01	—	50 ml	clear	Laboratory QC sample
2	Laboratory Control	A-02	—	50 ml		Laboratory QC sample
3	1C5A	A-03	10.041	50 ml		
4	1C5A Dup.	A-04	10.064	50 ml		Laboratory QC sample
5	1C5B	A-05	10.062	50 ml		
6	1C5C	A-06	10.066	50 ml		
7	1C7A	A-07	10.028	50 ml	⑧ = ④	light yellow
8	1C7B	A-08	10.026	50 ml		
9	1C7C	A-09	10.058	50 ml		
10	1E6A	A-10	10.025	50 ml		
11	1E6B	A-11	10.022	50 ml		
12	1E6C	A-12	10.034	50 ml		
13	1E9A	A-13	10.052	50 ml		
14	1E9B	A-14	10.020	50 ml		
15	1E9C	A-15	10.021	50 ml		
16	1G6A	A-16	10.079	50 ml		
17	1G6B	A-17	10.039	50 ml		
18	1G6C	A-18	10.049	50 ml		orange color in sample
19	1G8A	A-19	10.021	50 ml		
20	1E6C FD	A-20	10.042	50 ml		

Note/Comment:

QA officer Review/Initial: Date:

Laboratory Manager Review/Initial Date:

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

7002000

Analysis Date: 4/4/02 — TNT Test Kit ID: 1E1165 5/03
Batch Number: A — Analyst Initial:
Wavelength Used: 540 nm — Instrument: Hach DR2000
$Abs_{background}$: 0.000 — Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	Reported	Comments
1	Method Blank	A-01	-0.002	0.020			light yellow
2	Laboratory Control	A-02	0.011	0.255			
3	1C5A	A-03	-0.001	0.005			
4	1C5A Dup	A-04	-0.002	0.005			Lab. Dup.
5	1C5B	A-05	-0.002	0.003			~~light pink~~ IA
6	1C5C	A-06	-0.002	0.021			light pink
7	1C7A	A-07	0.013	0.212			light yellow - pink
8	1C7B	A-08	~~0.005~~ -0.001	0.003			re-zero instrument - Re.
9	1C7C	A-09	-0.002	0.003			
10	1E6A	A-10	0.000	0.006			Re-zero
11	1E6B	A-11	-0.001	0.003			
12	1E6C	A-12	-0.001	0.008			
13	1E9A	A-13	0.004	~~0.016~~ 0.059			light pink
14	1E9B	A-14	0.001	0.016			
15	1E9C	A-15	0.002	0.033			light orange
16	1G6A	A-16	0.002	0.026			
17	1G6B	A-17	-0.001	0.004			
18	1G6C	A-18	0.000	0.020			
19	1G8A	A-19	0.000	0.006			
20	1E6C FD	A-20	-0.001	0.007			

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

control - rerun - Abs initial 0.015 / 0.272

rerun - MB Abs initial 0.003 / Abs sample 0.013

QA officer Review/Initial: ______ Date: ______
Laboratory Manager Review/In ______ Date: ______

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date:	4/4/02	RDX Test Kit ID:	7085000 1K1125 10/02
Batch Number:	A	Analyst Initial:	MJ
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	-0.001	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	Method Blank	A-01	0.003			
2	Laboratory Control	A-02	0.062			
3	1C5A	A-03	0.004			
4	1C5A Dup.	A-04	0.003			Lab. Dup.
5	1C5B	A-05	0.004			
6	1C5C	A-06	0.004			
7	1C7A	A-07	1.764			dark pink. Need 10x dil.
8	1C7B	A-08	0.003			
9	1C7C	A-09	0.027			
10	1E6A	A-10	0.006			
11	1E6B	A-11	0.004			
12	1E6C	A-12	0.004			
13	1E9A	A-13	0.121			pink
14	1E9B	A-14	0.012			
15	1E9C	A-15	0.008			
16	1G6A	A-16	0.003			
17	1G6B	A-17	0.004			
18	1G6C	A-18	0.011			
19	1G8A	A-19	0.003			
20	1E6C FD	A-20	0.004			

Notes: 1) Abs for lab control sample must be between 0.069 to ~~1.079~~ 0.105 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

LCS was re-analyzed w/ same result 0.062

QA officer Review/Initial: ____________ Date: ________

Lab. Manager Review/Initial: ____________ Date: ________

Extraction Log - TNT and RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Extraction Date: 4/4/02 Extraction Kit ID: 51165 exp 5/23

Batch Number: B Analyst Initial: Qi, Chai-Chu

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01	-	50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02	-	50 ml		Laboratory QC sample
3	1G8B	B-03	10.027	50 ml		4/3/02 11:02
4	1G8B Dup	B-04	10.041	50 ml		Lab Dup.
5	1G8C	B-05	10.060	50 ml	light yellow	4/3/02 11:04
6	1P3A	B-06	10.068	50 ml	light yellow	4/3/02 14:35
7	1P3B	B-07	10.046	50 ml		4/3/02 14:38
8	1P3C	B-08	10.032	50 ml		4/3/02 14:42
9	1P7A	B-09	10.023	50 ml	light yellow	4/3/02 15:05
10	1P7B	B-10	10.047	50 ml	brown/orange	4/3/02 15:07
11	1P7C	B-11	10.008	50 ml	yellow/brown	4/3/02 15:11
12	1Q4A	B-12	10.045	50 ml		4/3/02 15:45
13	1Q4B	B-13	10.073	50 ml	light yellow	4/3/02 15:47
14	1Q4C	B-14	10.05	50 ml		4/3/02 15:52
15	1P3C FD	B-15	10.053	50 ml		4/3/02 0:00
16	1Q6A	B-16	10.075	50 ml	yellow/brown	4/3/02 18:25
17	1Q6B	B-17	10.05	50 ml	brown/orange	4/3/02 18:27
18	1Q6C	B-18	10.022	50 ml	brown/orange	4/3/02 18:32
19	1H5A	B-19	10.056	50 ml		4/4/02 7:50
20	1H5B	B-20	10.038	50 ml		4/4/02 7:52

Note/Comment:

QA officer Review/Initial: ______________ Date: ______________

Laboratory Manager Review/Ini ______________ Date: ______________

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/4/02 Extraction Kit ID:

Batch Number: B Analyst Initial: JA

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01	—	50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02	—	50 ml		Laboratory QC sample
3	1G8B	B-03	10.027	50 ml		
4	1G8B Dup	B-04	10.041	50 ml		Laboratory QC sample
5	1G8C	B-05	10.060	50 ml	L.L. Yellow	
6	1P3A	B-06	10.068	50 ml	L. Yellow	
7	1P3B	B-07	10.046	50 ml		
8	1P3C	B-08	10.032	50 ml		
9	1P7A	B-09	10.033	50 ml	L. yellow	
10	1P7B	B-10	10.047	50 ml	Brown-Yellow-orange	
11	1P7C	B-11	10.008	50 ml	Brown-Yellow	
12	1Q4A	B-12	10.045	50 ml		
13	1Q4B	B-13	10.073	50 ml	L.L. Yellow	
14	1Q4C	B-14	10.050	50 ml		
15	1P3C FD	B-15	10.053	50 ml		
16	1Q6A	B-16	10.075	50 ml	Yellow-Brown	
17	1Q6B	B-17	10.050	50 ml	Brown-orange	
18	1Q6C	B-18	10.022	50 ml	Brown-orange.	
19	1H5A	B-19	10.056	50 ml		
20	1H5B	B-20	10.038	50 ml		

Note/Comment:

QA officer Review/Initial: Date:

Laboratory Manager Review/Initial Date:

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/4/02	TNT Test Kit ID:	700 2000 1E1165 5/03
Batch Number:	B	Analyst Initial:	
Wavelength Used	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.001	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	Reported	Comments
1	**Method Blank**	B-01	0.001	0.002			
2	**Laboratory Control**	B-02	0.004	0.314			
3	1G8B	B-03	0.005	0.021			Light Pink
4	1G8B Dup	B-04	0.000	0.021			Lab. Dup. Light Pink
5	1G8C	B-05	0.004	0.172			Pink
6	1P3A	B-06	0.007	0.092			Light Pink
7	1P3B	B-07	-0.002	0.002			
8	1P3C	B-08	0.000	0.054			Light Pink
9	1P7A	B-09	0.005	0.094			Light Pink
10	1P7B	B-10	0.115	4.500			Dark Red.-
11	1P7C	B-11	0.069	4.500			Dark-Red-Black
12	1Q4A	B-12	-0.002	0.014			
13	1Q4B	B-13	0.005	0.064			light Pink
14	1Q4C	B-14	0.001	0.055			light Pink
15	1P3CFD	B-15	-0.001	0.060			light Pink
16	1Q6A	B-16	0.028	0.364			Pink
17	1Q6B	B-17	0.152	4.500			dark-red
18	1Q6C	B-18	0.075	1.203			dark-red
19	1H5A	B-19	-0.001	0.009			
20	1H5B	B-20	-0.001	0.007			

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

5/22.5	1Q6C	(DF=10)	Abs initial	0.020	Abs sample	0.153	
5/24.5	1Q6B	(DF=50)		0.009		3.891	
5/24.95	1Q6B	(DF=500)		0.003		0.492	
05/24.95	1P7B	(DF=500)	Abs initial	0.113	Abs sample	0.055	(see rerun)
05/24.95	1P7C	(DF=500)		~~0.056~~ 0.004		~~0.231~~ 0.209	rerun

QA officer Review/Initial: ____________ Date: ________

Laboratory Manager Review/In ____________ Date: ________

15/24.95 1P7B (DF=500) = 0.015 0.154

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/5/02____________ **Fraction:__TNT & RDX______________**

Lab:______Field Lab__________ **Project Name:__Tooele________________**

Reviewer:____RA_____________ **Date:____April 16, 2002_________________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: The absorbances for the LCS analyses were slightly greater than the upper control limit for batch numbers A and B for the RDX analyses. Positive results were flagged "J,l" in the associated samples.

Correctable Anomalies: None.

Comments: It should be noted that some LCS absorbances were less than the lower control limit specified in the method for TNT and RDX. The manufacturer, SDI, was contacted and required to conduct a stability study using the same TNT and RDX standards used in the field. The study indicated that the standard shipped to the field was degraded. URS then required SDI to re-certify the standard. Four replicate analyses were performed, under controlled conditions, of the standard lots in question. The average absorbance +/- 3 X STDEV was used to establish new control limits for the LCS analyses. All absorbances were within the newly established window.

Signed: R Aryan

SDI

Jason Ai
URS Corp.
849 International Drive, Suite 320
Linthicum, MD 21090

Strategic Diagnostics Incorporated
111 Pencader Drive
Newark, DE 19702

Dear Jason,

Thank you for using our Ensys TNT and RDX test kits on your Tooele Project. We truly appreciate doing business with URS, and your office in particular. The Ensys TNT and RDX test kits passed our internal QC and are functioning properly. SDI has recently run both the Ensys TNT and RDX test kits for the lots that you are using and shown that the QA/QC standards are resulting in absorbance values lower than indicated in the User's Guide.

The absorbances that SDI has obtained using a Hach DR2010 for the TNT and RDX standards are:

TNT:	RDX:
0.291	0.171
0.290	0.150
0.265	0.151
0.270	0.141

Based upon the the absorbance values that SDI has provided you, your calculations for the upper control limit and lower control limit for the test kits are correct.

Sincerely,

Rich Quashne
Southeastern Account Manager
Strategic Diagnostics, Inc.
(800) 544-8881 x244
(302) 456-6782 (Fax)
rquashne@sdix.com

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analyte indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
C	For reactive cyanide, MS or LCS recoveries less than 30%, but greater than zero.

The other type of code used by Dames & Moore is a "Reason Code". The reason code indicates the type of quality control failure that lead to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
c	Calibration failure; poor or unstable response	b	Instrument performance failure	c	Calibration failure
d	MS/MSD imprecision	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
e	LCSD imprecision	d	MS/MSD imprecision	e	LCSD imprecision
f	Field duplicate imprecision	e	LCSD imprecision	f	Field duplicate imprecision
h	Holding time violation	f	Field duplicate imprecision	h	Holding time violation
i	Internal standard failure	g	Dual column confirmation imprecision	k	Laboratory duplicate imprecision
j	Poor mass spectrometer performance	h	Holding time violation	l	LCS recovery failure
l	LCS recovery failure	i	Internal standard failure	m	MS/MSD recovery failure
m	MS/MSD recovery failure	l	LCS recovery failure	n	ICS failure
p	Poor chromatography	m	MS/MSD recovery failure	o	Calibration blank contamination
r	linearity failure in initial calibration	p	Poor chromatography	p	Preparation blank contamination
s	Surrogate failure	r	linearity failure in initial calibration	r	Linearity failure in calibration or MSA
t	Tuning failure	s	Surrogate failure	s	Serial dilution failure
w	Identification criteria failure	u	No confirmation column	v	Post-digestion spike failure
x	Field blank contamination	w	Retention time failure	x	Field blank contamination
y	Trip blank contamination	x	Field blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	z	Method blank contamination	Q	Other - see bottom of data report for explanation
Q	Other - see bottom of data report for explanation	Q	Other - see bottom of data report for explanation		
k	Tentatively Identified Compounds (TICs)				

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/5/02 Extraction Kit ID: 1E1165 5/03

Batch Number: A Analyst Initial: JA

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	1H5C	A-03	10.028	50 ml		4/4/02 7:59
4	1H5C Dup	A-04	10.037	50 ml		Lab. Dup.
5	1I6A	A-05	10.073	50 ml		4/4/02 8:25
6	1I6B	A-06	10.084	50 ml		4/4/02 8:27
7	1I6C	A-07	10.044	50 ml	L. Yellow	4/4/02 8:32
8	1H5C FD	A-08	10.033	50 ml		4/4/02 7:59
9	1N7A	A-09	10.065	50 ml	L. Yellow	4/4/02 13:15
10	1N7B	A-10	10.030	50 ml	Yellow	4/4/02 13:18
11	1N7C	A-11	10.078	50 ml	L. Yellow	4/4/02 13:25
12	1N7C FD	A-12	10.027	50 ml	L. Yellow	4/4/02 13:25
13	1Q8A	A-13	10.030	50 ml	Yellow	4/4/02 14:00
14	1Q8B	A-14	10.024	50 ml	Orange	4/4/02 14:02
15	1Q8C	A-15	10.029	50 ml	Yellow	4/4/02 14:05
16	1R5A	A-16	10.017	50 ml	L. Yellow	4/4/02 14:30
17	1R5B	A-17	10.053	50 ml		4/4/02 14:32
18	1R5C	A-18	10.028	50 ml		4/4/02 14:37
19	1S7C FD	A-19	10.050	50 ml	Orange	4/4/02 16:05
20	1S7C	A-20	10.077	50 ml	Orange	4/4/02 16:05

Note/Comment:

QA officer Review/Initial: [signature] Date: 4/16/02

Laboratory Manager Review/Initial: [signature] Date: 4/16/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: A
Wavelength Used: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID: 1E1165 5/03
Analyst Initial: JA
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.001	0.0	0.7 U	
2	**Laboratory Control**	A-02	0.006	0.283	8.0	**8.0**	
3	1H5C	A-03	0.001	0.019	0.5	0.7 U	Light Pikk
4	1H5C Dup	A-04	0.001	0.022	0.6	0.7 U	Lab. Dup.
5	1I6A	A-05	0.002	0.020	0.4	0.7 U	Light Yellow
6	1I6B	A-06	0.003	0.027	0.5	0.7 U	L.L. Pink
7	1I6C	A-07	0.022	0.252	5.1	**5.1**	
8	1H5C FD	A-08	0.000	0.023	0.7	**0.7**	
9	1N7A	A-09	0.005	0.096	2.4	**2.4**	L. Pink
10	1N7B	A-10	0.049	4.500	133.3	**133.3**	Red - See DL
11	1N7C	A-11	0.012	0.216	5.2	**5.2**	Pink
12	1N7C FD	A-12	0.013	0.215	5.0	**5.0**	Pink
13	1Q8A	A-13	0.040	0.675	15.9	**15.9**	Dark Pink
14	1Q8B	A-14	0.198	4.500	114.8	**114.8**	Dark Red - See DL
15	1Q8C	A-15	0.053	0.749	16.6	**16.6**	Dark Pink
16	1R5A	A-16	0.019	0.128	1.6	**1.6**	Light Pink
17	1R5B	A-17	0.005	0.031	0.3	0.7 U	Re-zero Instrument
18	1R5C	A-18	0.006	0.085	1.9	**1.9**	Pink
19	1S7C FD	A-19	0.143	4.500	121.6	**121.6**	Dark Red - See DL
20	1S7C	A-20	0.143	4.500	121.6	**121.6**	Dark Red - See DL
21	1N7B	A-10DL	0.004	0.022	92.9	**92.9**	500 x Dilution
22	1N7B	A-10DL	0.006	0.188	253.9	**253.9**	50 x Dilution
23	1Q8B	A-14DL	0.008	0.085	164.1	**164.1**	100 x Dilution
24	1S7C FD	A-19DL	0.009	0.062	80.5	**80.5**	100 x Dilution
25	1S7C	A-20DL	0.007	0.060	99.1	**99.1**	100 x Dilution

Notes: 1) Abs for lab control sample must be between 0.239 to 0.319 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/16/02
Laboratory Manager Review/Ini [signature] Date: 4/16/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/5/02	RDX Test Kit ID:	1K1125 10/02
Batch Number:	A	Analyst Initial:	MS
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	-0.001	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments	
1	**Method Blank**	A-01	0.003	-0.3	0.8 U		
2	**Laboratory Control**	A-02	0.097	10.3	**10.3**		
3	1H5C	A-03	0.002	-0.4	0.8 U		
4	1H5C Dup	A-04	0.002	-0.4	0.8 U	Lab. Dup.	
5	1I6A	A-05	0.003	-0.3	0.8 U		
6	1I6B	A-06	0.004	-0.2	0.8 U		
7	1I6C	A-07	0.013	0.8	**0.8**	very light pink	J, ℓ
8	1H5C FD	A-08	0.004	-0.2	0.8 U		
9	1N7A	A-09	0.503	55.9	**55.9**	bubblegum pink need 2 x DL	J, ℓ
10	1N7B	A-10	0.019	1.5	**1.5**	slight yellow/brown	
11	1N7C	A-11	0.017	1.3	**1.3**	very slight pink	
12	1N7C FD	A-12	0.019	1.5	**1.5**	very slight pink	
13	1Q8A	A-13	0.694	77.4	**77.4**	bubblegum pink need 5 x DL	
14	1Q8B	A-14	1.931	216.3	**216.3**	red need 20 x DL	
15	1Q8C	A-15	1.091	122.0	**122.0**	bubblegum pink need 5 x DL	
16	1R5A	A-16	1.509	168.9	**168.9**	bubblegum pink need 10 x DL	J, ℓ
17	1R5B	A-17	0.010	0.5	0.8 U		
18	1R5C	A-18	0.009	0.4	0.8 U		
19	1S7C FD	A-19	0.017	1.3	**1.3**	slight yellow/brown	J, ℓ
20	1S7C	A-20	0.018	1.4	**1.4**	slight yellow/brown	J, ℓ

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/10/02
Lab. Manager Review/Initial: [signature] Date: 4/16/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/5/02 Extraction Kit ID: 1E1165 5/03

Batch Number: B Analyst Initial: MS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	1S4A	B-03	10.034	50 ml		4/4/02 15:35
4	1S4A Dup	B-04	10.012	50 ml		Laboratory QC sample
5	1S4B	B-05	10.007	50 ml		4/4/02 15:37
6	1S4C	B-06	10.037	50 ml		4/4/02 15:42
7	1S7A	B-07	9.997	50 ml		4/4/02 15:55
8	1S7B	B-08	10.034	50 ml	Red/Brown	4/4/02 15:57
9	1I8A	B-09	10.032	50 ml		4/4/02 8:50
10	1I8B	B-10	10.030	50 ml		4/4/02 8:52
11	1I8C	B-11	10.006	50 ml		4/4/02 8:55
12	1J5A	B-12	9.997	50 ml		4/4/02 9:05
13	1J5B	B-13	10.027	50 ml		4/4/02 9:07
14	1J5C	B-14	9.993	50 ml		4/4/02 9:12
15	1K4A	B-15	10.001	50 ml		4/4/02 9:35
16	1K4B	B-16	10.014	50 ml		4/4/02 9:37
17	1K4C	B-17	10.014	50 ml		4/4/02 9:42
18	1I8C FD	B-18	10.004	50 ml		4/4/02 8:55
19	1K6A	B-19	10.008	50 ml		4/4/02 10:05
20	1K6B	B-20	10.023	50 ml		4/4/02 10:07

Note/Comment:

QA officer Review/Initial: Date: 4/16/02

Laboratory Manager Review/Initial: Date: 4/16/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: B
Wavelength Used: 540 nm
$Abs_{background}$: 0.002

TNT Test Kit ID: 1E1165 5/03
Analyst Initial: JA
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.002	0.000	-0.2	0.7 U	
2	**Laboratory Control**	B-02	0.024	0.279	5.7	**5.7**	
3	1S4A	B-03	0.001	0.011	0.2	0.7 U	
4	1S4A Dup	B-04	0.002	0.014	0.2	0.7 U	Lab. Dup.
5	1S4B	B-05	0.002	0.017	0.3	0.7 U	
6	1S4C	B-06	0.018	0.161	2.8	**2.8**	L. Yellow Pink
7	1S7A	B-07	0.019	0.177	3.1	**3.1**	L. Yellow Pink
8	1S7B	B-08	0.105	4.500	126.3	**126.3**	Yellow Dark Red
9	1I8A	B-09	0.004	0.026	0.3	0.7 U	L. Yellow
10	1I8B	B-10	0.002	0.020	0.4	0.7 U	L. Pink
11	1I8C	B-11	0.015	0.225	5.1	**5.1**	L. Yellow
12	1J5A	B-12	0.002	0.015	0.2	0.7 U	
13	1J5B	B-13	0.003	0.011	0.0	0.7 U	
14	1J5C	B-14	0.004	0.072	1.7	**1.7**	
15	1K4A	B-15	0.003	0.010	-0.1	0.7 U	
16	1K4B	B-16	0.004	0.014	-0.1	0.7 U	
17	1K4C	B-17	0.006	0.050	0.8	**0.8**	
18	1I8C FD	B-18	0.018	0.239	5.2	**5.2**	L. Yellow
19	1K6A	B-19	0.012	0.100	1.6	**1.6**	L. Yellow
20	1K6B	B-20	0.010	0.069	0.9	**0.9**	L. Yellow
21	1S7B	B-08DL	0.007	1.008	1517.0	**1517.0**	50 x Dilution
22	1S7B	B-08DL	0.008	0.530	1541.8	**1541.8**	100 x Dilution

Notes: 1) Abs for lab control sample must be between 0.239 to 0.319 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

Re- run Control $Abs_{initial}$ 0.006 Abs_{sample} 0.267

QA officer Review/Initial: [signature] Date: 4/16/02
Laboratory Manager Review/Ini [signature] Date: 4/16/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/5/02	RDX Test Kit ID:	1K1125 10.02
Batch Number:	B	Analyst Initial:	MS
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	0	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments	
1	**Method Blank**	B-01	0.003	-0.3	0.8 U		
2	**Laboratory Control**	B-02	0.080	8.4	**8.4**		
3	1S4A	B-03	0.001	-0.5	0.8 U		
4	1S4A Dup	B-04	0.001	-0.5	0.8 U	Lab. Dup.	
5	1S4B	B-05	0.003	-0.3	0.8 U		
6	1S4C	B-06	0.005	-0.1	0.8 U		
7	1S7A	B-07	0.801	89.4	**89.4**	bubblegum pink	J,l
8	1S7B	B-08	0.043	4.2	**4.2**	dark yellow	J,l
9	1I8A	B-09	0.003	-0.3	0.8 U		
10	1I8B	B-10	0.003	-0.3	0.8 U		
11	1I8C	B-11	0.005	-0.1	0.8 U		
12	1J5A	B-12	0.003	-0.3	0.8 U		
13	1J5B	B-13	0.002	-0.4	0.8 U		
14	1J5C	B-14	0.002	-0.4	0.8 U		
15	1K4A	B-15	0.002	-0.4	0.8 U		
16	1K4B	B-16	0.002	-0.4	0.8 U		
17	1K4C	B-17	0.002	-0.4	0.8 U		
18	1I8C FD	B-18	0.004	-0.2	0.8 U		
19	1K6A	B-19	1.162	129.9	**129.9**	dark pink/red	J,l
20	1K6B	B-20	0.007	0.2	0.8 U		
21	1N7A	B-21 DL	0.191	41.7	**41.7**	2x dilution	J,l
22	1Q8A	B-22 DL	0.233	127.8	**127.8**	5x dilution	
23	1Q8B	B-23 DL	0.459	1019.1	**1019.1**	20x dilution	
24	1Q8C	B-24 DL	0.148	80.1	**80.1**	5x dilution	
25	1R5A	B-25 DL	0.126	135.4	**135.4**	10x dilution	
26	1Q8B	B-26 DL	0.174	946.6	**946.6**	50x dilution	J,

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/16/02
Lab. Manager Review/Initial: [signature] Date: 4/16/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/5/02 Extraction Kit ID: 1E1165 5/03

Batch Number: C Analyst Initial: MS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	C-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	C-02		50 ml		Laboratory QC sample
3	1K6C	C-03	9.996	50 ml		4/4/02 10:12
4	1K6C Dup	C-04	10.036	50 ml		Laboratory QC sample
5	1M4A	C-05	10.015	50 ml		4/4/02 10:40
6	1M4B	C-06	10.016	50 ml		4/4/02 10:42
7	1M4C	C-07	10.010	50 ml		4/4/02 10:47
8	1K6C FD	C-08	10.025	50 ml		4/4/02 10:12
9	1M6A	C-09	10.005	50 ml		4/4/02 11:00
10	1M6B	C-10	10.015	50 ml		4/4/02 11:02
11	1M6C	C-11	10.024	50 ml		4/4/02 11:05
12	1N5A	C-12	10.019	50 ml		4/4/02 11:20
13	1N5B	C-13	10.004	50 ml		4/4/02 11:22
14	1N5C	C-14	9.997	50 ml		4/4/02 11:27
15						
16						
17						
18						
19						
20						

Note/Comment:

QA officer Review/Initial: [signature] Date: 4/16/02

Laboratory Manager Review/Initial: [signature] Date: 4/16/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/5/02	TNT Test Kit ID:	1E1165 5/03
Batch Number:	C	Analyst Initial:	JA
Wavelength Used:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.000	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	C-01	0.000	0.000	0.0	0.7 U	
2	**Laboratory Control**	C-02	0.002	0.306	9.2	**9.2**	
3	1K6C	C-03	0.004	0.087	2.2	**2.2**	Pink
4	1K6C Dup	C-04	0.003	0.081	2.1	**2.1**	Lab. Dup.
5	1M4A	C-05	0.002	0.027	0.6	0.7 U	
6	1M4B	C-06	0.004	0.016	0.0	0.7 U	
7	1M4C	C-07	0.003	0.089	2.4	**2.4**	Pink
8	1K6C FD	C-08	0.005	0.091	2.2	**2.2**	Pink
9	1M6A	C-09	0.006	0.054	0.9	**0.9**	
10	1M6B	C-10	0.012	0.265	6.7	**6.7**	L. Yellow - Pink
11	1M6C	C-11	0.004	0.182	5.1	**5.1**	Pink
12	1N5A	C-12	0.001	0.013	0.3	0.7 U	
13	1N5B	C-13	0.000	0.052	1.6	**1.6**	
14	1N5C	C-14	0.012	0.277	7.1	**7.1**	L. Yellow - Pink
15							
16							
17							
18							
19							
20							

Notes: 1) Abs for lab control sample must be between 0.239 to 0.319 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/16/02
Laboratory Manager Review/Initial: [signature] Date: 4/16/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: C
Wavelength Used: 510 nm
$Abs_{background}$: -0.000

RDX Test Kit ID: 1K1125 exp. 10/02
Analyst Initial: MS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	C-01	0.000	-0.6	0.8 U	
2	**Laboratory Control**	C-02	0.073	7.6	**7.6**	
3	1K6C	C-03	0.011	0.6	0.8 U	
4	1K6C Dup	C-04	0.012	0.7	0.8 U	Lab. Dup.
5	1M4A	C-05	0.006	0.1	0.8 U	
6	1M4B	C-06	0.004	-0.2	0.8 U	
7	1M4C	C-07	0.01	0.5	0.8 U	
8	1K6C FD	C-08	0.008	0.3	0.8 U	
9	1M6A	C-09	0.144	15.6	**15.6**	pink
10	1M6B	C-10	0.015	1.1	**1.1**	very slight pink
11	1M6C	C-11	0.01	0.5	0.8 U	
12	1N5A	C-12	0.008	0.3	0.8 U	
13	1N5B	C-13	0.001	-0.5	0.8 U	
14	1N5C	C-14	0.007	0.2	0.8 U	
15	1S7A	B-07DL	0.095	50.3	**50.3**	5x dilution
16	1K6A	B-18DL	0.092	48.6	**48.6**	5x dilution
17						
18						
19						
20						

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/10/02
Lab. Manager Review/Initial: [signature] Date: 4/16/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 7/5/02 Extraction Kit ID: 1E1165 5/13

Batch Number: A Analyst Initial:

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01	—	50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02	—	50 ml		Laboratory QC sample
3	1H5C	A-03	10.028	50 ml		
4	1H5C Dup	A-04	10.037	50 ml		Laboratory QC sample
5	1I6A	A-05	10.073	50 ml		
6	1I6B	A-06	10.084	50 ml		
7	1I6C	A-07	10.044	50 ml	light yellow	
8	1H5C FD	A-08	10.033	50 ml		
9	1N7A	A-09	10.065	50 ml	light yellow	
10	1N7B	A-10	10.030	50 ml	yellow	
11	1N7C	A-11	10.078	50 ml	light yellow	
12	1N7C FD	A-12	10.027	50 ml	light yellow	
13	1Q8A	A-13	10.030	50 ml	yellow	
14	1Q8B	A-14	10.024	50 ml	orange-Brown	
15	1Q8C	A-15	10.029	50 ml	yellow	
16	1R5A	A-16	10.017	50 ml	light yellow	
17	1R5B	A-17	10.053	50 ml		
18	1R5C	A-18	10.028	50 ml		
19	1S7C FD	A-19	10.050	50 ml	orange-yellow	
20	1S7C	A-20	10.077	50 ml	orange-yellow	

Note/Comment:

QA officer Review/Initial: Date:

Laboratory Manager Review/Initial Date:

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: A
Wavelength Used: 540 nm
$Abs_{background}$: 0.000
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

TNT Test Kit ID:
Analyst Initial:
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	Method Blank	A-01	0.000	0.001			
2	Laboratory Control	A-02	0.006	0.283			Low
3	1H5C	A-03	0.001	0.019			light pink
4	1H5C Dup	A-04	0.001	0.022			Lab. Dup. light Pink
5	1I6A	A-05	0.002	0.020			light yellow
6	1I6B	A-06	1.003	0.027			L.L. Pink
7	1I6C	A-07	0.022	0.282			
8	1H5C FD	A-08	0.000	0.023			
9	1N7A	A-09	0.005	0.096			light Pink
10	1N7B	A-10	1.049	4.500.			Red.- see-DL
11	1N7C	A-11	0.012	0.216			Pink
12	1N7C FD	A-12	0.013	0.215			Pink
13	1Q8A	A-13	0.040	0.675			dark Pink
14	1Q8B	A-14	0.198	4.500			Dark red - see DL
15	~~1Q8C + R5A~~ TA	A-15	0.053	0.749			dark Pink
16	~~1R5A + R5B~~ TA	A-16	0.019	0.128			light Pink
17	1R5B ~~+ R5C~~ TA	A-17	~~0.012~~ TA 0.005	0.031			Re-zero Instrument
18	1R5C+ TA	A-18	0.006	0.085			Pink
19	1S7C FD	A-19	0.143	4.500			dark-red
20	1S7C	A-20	0.143	4.500			dark-red

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

0.05/24.95	1N7B7	A-10DL	0.004	0.022.	(DF=500)	
0.5/24.50	1N7B7	A-10DL	0.006	0.188	(DF=50)	
0.25/24.75	1Q5B	A-14DL	0.008	0.085	(DF=100)	Pink
0.25/24.75	1S7CFD	A-19DL	0.009	0.062	(DF=100)	Pink
0.25/24.75	1S7C	A-20DL	0.007	0.060	(DF=100)	

QA officer Review/Initial: Date:
Laboratory Manager Review/In Date:

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: A
Wavelength Used: 510 nm
$Abs_{background}$: -0.001

RDX Test Kit ID:
Analyst Initial:
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	Method Blank	A-01	0.003			
2	Laboratory Control	A-02	0.097			
3	1H5C	A-03	0.002			
4	1H5C Dup	A-04	0.002			Lab. Dup.
5	1I6A	A-05	0.003			
6	1I6B	A-06	0.004			
7	1I6C	A-07	0.013			very light pink
8	1H5C FD	A-08	0.004			
9	1N7A	A-09	0.503			bubblegum pink need dil 2x
10	1N7B	A-10	0.019			slight brown/yellow
11	1N7C	A-11	0.017			very slight pink
12	1N7C FD	A-12	0.019			very slight pink
13	1Q8A	A-13	0.694			bubblegum pink need dil 5:
14	1Q8B	A-14	1.931			red need dil 2[illegible]
15	1Q8C	A-15	1.091			bubblegum pink need dil 5
16	1R5A	A-16	1.509			bubblegum pink need dil 1[illegible]
17	1R5B	A-17	0.010			
18	1R5C	A-18	0.009			
19	1S7C FD	A-19	0.017			slight brown/yellow
20	1S7C	A-20	0.018			slight brown/yellow

Notes: 1) Abs for lab control sample must be between 0.069 to ~~1.079~~ 0.108 JA for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: Date:
Lab. Manager Review/Initial: Date:

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/5/02 Extraction Kit ID: E1165 5/02

Batch Number: B Analyst Initial:

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	1S4A	B-03	10.034	50 ml		light grey
4	1S4A Dup.	B-04	10.012	50 ml		Laboratory QC sample
5	1S4B	B-05	10.007	50 ml		
6	1S4C	B-06	10.037	50 ml		yellow/grey
7	1S7A	B-07	9.997	50 ml		brown/grey
8	1S7B	B-08	10.034	50 ml		red/brown
9	1I8A	B-09	10.032	50 ml		brown/grey
10	1I8B	B-10	10.030	50 ml		
11	1I8C	B-11	10.006	50 ml		
12	1J5A	B-12	9.997	50 ml		
13	1J5B	B-13	10.027	50 ml		
14	1J5C	B-14	9.993	50 ml		
15	1K4A	B-15	10.001	50 ml		
16	1K4B	B-16	10.014	50 ml		
17	1K4C	B-17	10.014	50 ml		
18	1I8C FD	B-18	10.004	50 ml		
19	1K6A	B-19	10.008	50 ml		
20	1K6B	B-20	10.023	50 ml		

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Note/Comment:

QA officer Review/Initial: Date:

Laboratory Manager Review/Initial Date:

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: B
Wavelength Used: 540 nm
$Abs_{background}$: 0.002

TNT Test Kit ID: 1E1165 5/03
Analyst Initial:
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

	No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
	1	**Method Blank**	B-01	0.002	0.000			
	2	**Laboratory Control**	B-02	0.024	0.279			Low. - Rerun
	3	1S4A	B-03	0.001	0.011			
	4	1S4A Dup	B-04	0.002	0.014			Lab. Dup.
	5	1S4B	B-05	0.002	0.017			
	6	1S4C	B-06	0.018	0.161			light yellow - Pink
	7	1S7A	B-07	0.019	0.177			L. yellow - Pink
*	8	1S7B	B-08	0.105	4.500			yellow - Dark-Red
	9	1I8A	B-09	0.004	0.026			Light yellow
	10	1I8B	B-10	0.002	0.020			light Pink
	11	1I8C	B-11	0.015	0.225			light yellow
	12	1J5A	B-12	0.002	0.015			
	13	1J5B	B-13	0.003	0.011			
	14	1J5C	B-14	0.004	0.072			
	15	1K4A	B-15	0.003	0.010			
	16	1K4B	B-16	0.004	0.014			
	17	1K4C	B-17	0.006	0.050			
	18	1I8C FD	B-18	0.018	0.239			light yellow
	19	1K6A	B-19	0.012	0.100			"
	20	1K6B	B-20	0.010	0.069			"

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

control Re-Run Abs initial 0.006 Abs sample 0.269

.5/24.50 1S7B DL B-08 DL Abs initial 0.007 Abs sample 1.008 (DF= 50)
.25/24.75 1S7B DL B-08 DL " 0.008 " 0.530 (DF=100)

QA officer Review/Initial: ________ Date: ________
Laboratory Manager Review/In ________ Date: ________

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date:	4/5/02	RDX Test Kit ID:	1K1125 10/02
Batch Number:	B	Analyst Initial:	MS
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	-0.000	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	Method Blank	B-01	0.003			
2	Laboratory Control	B-02	0.080			
3	1S4A	B-03	0.001			
4	1S4A Dup	B-04	0.001			Lab. Dup.
5	1S4B	B-05	0.003			
6	1S4C	B-06	0.005			
7	1S7A	B-07	0.801			bubble gum pink needs 5x dil
8	1S7B	B-08	0.043			dark yellow
9	~~1S7C~~ 1I8A	B-09	0.003			
10	~~1I8A~~ 1I8B	B-10	0.003			
11	~~1I8B~~ 1I8C	B-11	0.005			
12	~~1I8C~~ 1J5A	B-12	0.003			
13	~~1J5A~~ 1J5B	B-13	0.002			
14	~~1J5B~~ 1J5C	B-14	0.002			
15	~~1J5C~~ 1K4A	B-15	0.002			
16	~~1K4A~~ 1K4B	B-16	0.002			
17	~~1K4B~~ 1K4C	B-17	0.002			
18	~~1K~~ 1I8C FD	B-18	0.004			
19	1K6A	B-19	1.162			dark pink/red needs 5x dil
20	1K6B	B-20	0.007			

Notes: 1) Abs for lab control sample must be between 0.069 to 1.079 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

21	1N7A	A-09 DL	0.191	2x dil
22	1Q8A	A-13 DL	0.233	5x dil
23	1Q8B	A-14 DL	0.459	20x dil (needs 50x
24	1Q8C	A-15 DL	0.148	5x dil
25	1R5A	A-16 DL	0.126	10x dil
26	1Q8B	A-14 DL	0.174	50x dil

QA officer Review/Initial: ____________ Date: ________

Lab. Manager Review/Initial: ____________ Date: ________

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/5/02 Extraction Kit ID: 1 E1165 5/03

Batch Number: C Analyst Initial:

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	C-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	C-02		50 ml		Laboratory QC sample
3	1K6C	C-03	9.996	50 ml		
4	1K6C Dup	C-04	10.036	50 ml		Laboratory QC sample
5	1M4A	C-05	10.015	50 ml		grey / brown
6	1M4B	C-06	10.016	50 ml		
7	1M4C	C-07	10.010	50 ml		
8	1K6C FD	C-08	10.025	50 ml		
9	1M6A	C-09	10.006	50 ml		grey / brown
10	1M6B	C-10	10.015	50 ml		brown / yellow
11	1M6C	C-11	10.024	50 ml		
12	1N5A	C-12	10.019	50 ml		light grey
13	1N5B	C-13	10.004	50 ml		light grey
14	1N5C	C-14	9.997	50 ml		
15		C-15		50 ml		
16		C-16		50 ml		
17		C-17		50 ml		
18		C-18		50 ml		
19		C-19		50 ml		
20		C-20		50 ml		

Note/Comment:

QA officer Review/Initial: Date:

Laboratory Manager Review/Initial Date:

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Analysis Date: 4/5/02
Batch Number: C
Wavelength Used: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID: 1E1165 5/03
Analyst Initial:
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	Method Blank	C-01	0.000	0.000			
2	Laboratory Control	C-02	0.002	0.306			
3	1K6C	C-03	0.004	0.087			Pink
4	1K6C Dup	C-04	0.003	0.081			Lab. Dup. Pink
5	1M4A	C-05	0.002	0.027			
6	1M4B	C-06	0.004	0.016			
7	1M4C	C-07	0.003	0.089			Pink
8	1K6CFD	C-08	0.005	0.091			Pink
9	1M6A	C-09	0.006	0.054			
10	1M6B	C-10	0.012	0.265			light yellow - Pink
11	1M6C	C-11	0.004	0.182			Pink
12	1N5A	C-12	0.001	0.013			
13	1N5B	C-13	0.000	0.052			
14	1N5C	C-14	0.012	0.277			light yellow - Pink
15		C-15					
16		C-16					
17		C-17					
18		C-18					
19		C-19					
20		C-20					

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: ______ Date: ______
Laboratory Manager Review/In ______ Date: ______

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date:	4/5/02	RDX Test Kit ID:	1K1125 10/02
Batch Number:	C	Analyst Initial:	MW
Wavelength Used:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	-0.000	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	Method Blank	C-01	0.000			
2	Laboratory Control	C-02	0.073			
3	1K6C	C-03	0.011			
4	1K6C Dup	C-04	0.012			Lab. Dup.
5	1M4A	C-05	0.006			
6	1M4B	C-06	0.004			
7	1M4C	C-07	0.010			
8	1K6C FD	C-08	0.008			
9	1M6A	C-09	0.144			pink
10	1M6B	C-10	0.015			very slight pink
11	1M6C	C-11	0.010			
12	1N5A	C-12	0.008			
13	1N5B	C-13	0.001			
14	1N5C	C-14	0.007			
15	1S7A	C-15	0.095			5x dil.
16	1K6A	C-16	0.092			5x dil.
17		C-17				
18		C-18				
19		C-19				
20		C-20				

Notes: 1) Abs for lab control sample must be between 0.069 to 1.079 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ____________ Date: ________

Lab. Manager Review/Initial: ____________ Date: ________

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/8/02____________ **Fraction:__TNT & RDX______________**

Lab:______Field Lab__________ **Project Name:__Tooele_________________**

Reviewer:____RA_____________ **Date:____April 9, 2002________________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: The %RPD for the field duplicate pair 2J7B/2J7BFD (53%) was greater than the QC limit (i.e. 35%) for RDX. These results were flagged "J,f" in these samples.

Correctable Anomalies: None.

Comments: None.

Signed: Rashmak Anjum

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analyte indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
C	For reactive cyanide, MS or LCS recoveries less than 30%, but greater than zero.

The other type of code used by Dames & Moore is a "Reason Code". The reason code indicates the type of quality control failure that lead to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
c	Calibration failure; poor or unstable response	b	Instrument performance failure	c	Calibration failure
d	MS/MSD imprecision	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
e	LCSD imprecision	d	MS/MSD imprecision	e	LCSD imprecision
f	Field duplicate imprecision	e	LCSD imprecision	f	Field duplicate imprecision
h	Holding time violation	f	Field duplicate imprecision	h	Holding time violation
i	Internal standard failure	g	Dual column confirmation imprecision	k	Laboratory duplicate imprecision
j	Poor mass spectrometer performance	h	Holding time violation	l	LCS recovery failure
l	LCS recovery failure	i	Internal standard failure	m	MS/MSD recovery failure
m	MS/MSD recovery failure	l	LCS recovery failure	n	ICS failure
p	Poor chromatography	m	MS/MSD recovery failure	o	Calibration blank contamination
r	linearity failure in initial calibration	p	Poor chromatography	p	Preparation blank contamination
s	Surrogate failure	r	linearity failure in initial calibration	r	Linearity failure in calibration or MSA
t	Tuning failure	s	Surrogate failure	s	Serial dilution failure
w	Identification criteria failure	u	No confirmation column	v	Post-digestion spike failure
x	Field blank contamination	w	Retention time failure	x	Field blank contamination
y	Trip blank contamination	x	Field blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	z	Method blank contamination	Q	Other - see bottom of data report for explanation
Q	Other - see bottom of data report for explanation	Q	Other - see bottom of data report for explanation		
k	Tentatively Identified Compounds (TICs)				

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date: 4/8/02
Batch Number: A
Wavelength: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID: 7002000 1E1165
Analyst Initial: MS AS
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.002	1	0.1	0.7 U	
2	**Laboratory Control**	A-02	0.002	0.318	1	9.6	9.6	
3	1T5A	A-03	0.011	0.100	1	1.7	1.7	slight pink
4	**1T5A LAB DUP**	A-04	0.011	0.100	1	1.7	1.7	slight pink
5	1T5B	A-05	0.008	0.169	1	4.2	4.2	pink
6	1T5C	A-06	0.014	0.242	1	5.8	5.8	bubblegum pink
7	1T5C FD	A-07	0.015	0.255	1	6.0	6.0	bubblegum pink
8	1E4A	A-08	0.002	0.007	1	0.0	0.7 U	
9	1E4B	A-09	0.002	0.004	1	-0.1	0.7 U	
10	1E4C	A-10	0.002	0.008	1	0.0	0.7 U	
11	1H4A	A-11	0.003	0.013	1	0.0	0.7 U	slight yellow
12	1H4B	A-12	0.002	0.002	1	-0.2	0.7 U	
13	1H4B FD	A-13	0.002	0.003	1	-0.2	0.7 U	
14	1H4C	A-14	0.002	0.002	1	-0.2	0.7 U	very slight yellow
15	1J3A	A-15	0.002	0.002	1	-0.2	0.7 U	
16	1J3B	A-16	0.002	0.008	1	0.0	0.7 U	
17	1J3C	A-17	0.003	0.027	1	0.5	0.7 U	very slight pink
18	1L3A	A-18	0.003	0.021	1	0.3	0.7 U	very slight yellow
19	1L3B	A-19	0.001	0.003	1	0.0	0.7 U	
20	1L3C	A-20	0.010	0.151	1	3.4	3.4	

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/4/02
Laboratory Manager Review: [signature] Date: 4/10/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/8/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: -0.000

RDX Test Kit ID: 7085000 1K1125
Analyst Initial: MS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.004	1	-0.2	0.8 U	
2	**Laboratory Control**	A-02	0.08	1	8.4	8.4	
3	1T5A	A-03	1.637	1	184.2	184.2	red
4	**1T5A LAB DUP**	A-04	1.225	1	137.7	137.7	red
5	1T5B	A-05	0.272	1	30.1	30.1	pink
6	1T5C	A-06	0.013	1	0.8	0.85	
7	1T5C FD	A-07	0.013	1	0.8	0.85	
8	1E4A	A-08	0.005	1	-0.1	0.8 U	
9	1E4B	A-09	0.004	1	-0.2	0.8 U	
10	1E4C	A-10	0.005	1	-0.1	0.8 U	
11	1H4A	A-11	0.004	1	-0.2	0.8 U	
12	1H4B	A-12	0.005	1	-0.1	0.8 U	
13	1H4B FD	A-13	0.006	1	0.1	0.8 U	
14	1H4C	A-14	0.005	1	-0.1	0.8 U	
15	1J3A	A-15	0.004	1	-0.2	0.8 U	
16	1J3B	A-16	0.004	1	-0.2	0.8 U	
17	1J3C	A-17	0.004	1	-0.2	0.8 U	
18	1L3A	A-18	0.006	1	0.1	0.8 U	
19	1L3B	A-19	0.005	1	-0.1	0.8 U	
20	1L3C	A-20	0.005	1	-0.1	0.8 U	

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: Date: 4/10/02
Lab. Manager Review/Initial: Date: 4/10/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample} - (Abs_{initial} X4)}{0.0323}$

Analysis Date: 4/8/02
Batch Number: B
Wavelength: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID: 7002000 1E1165
Analyst Initial: MS AS
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.003	0.001	1	-0.3	0.7 U	
2	**Laboratory Control**	B-02	0.005	0.308	1	8.9	8.9	
3	1N3A	B-03	0.007	0.081	1	1.6	1.6	slight pink
4	**1N3A LAB DUP**	B-04	0.008	0.091	1	1.8	1.8	light pink
5	1N3B	B-05	-0.001	0.002	1	0.2	0.7 U	
6	1N3C	B-06	-0.001	0.002	1	0.2	0.7 U	
7	2B6A	B-07	-0.001	0.019	1	0.7	0.7	
8	2B6B	B-08	-0.002	-0.001	1	0.2	0.7 U	
9	2B6C	B-09	-0.002	0.025	1	1.0	1.0	
10	2B8A	B-10	0.003	0.025	1	0.4	0.7 U	slight pink
11	2B8B	B-11	-0.002	0.002	1	0.3	0.7 U	
12	2B8C	B-12	-0.002	0.001	1	0.3	0.7 U	
13	2D6A	B-13	0.001	0.023	1	0.6	0.7 U	
14	2D6B	B-14	-0.001	0.010	1	0.4	0.7 U	
15	2D6C	B-15	-0.002	0.003	1	0.3	0.7 U	
16	2J7A	B-16	0.001	0.049	1	1.4	1.4	very slight brown/ pink
17	2J7B	B-17	-0.001	0.017	1	0.7	0.7 U	
18	2J7C	B-18	0.000	0.045	1	1.4	1.4	light pink
19	2J7B FD	B-19	-0.001	0.020	1	0.7	0.7	
20	2M8A	B-20	0.010	0.120	1	2.5	2.5	very slight brown/ pink

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: Date: 4/10/02
Laboratory Manager Review: Date: 4/10/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/8/02
Batch Number: B
Wavelength: 510 nm
$Abs_{background}$: -0.000
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

RDX Test Kit ID: 7085000 1K1125
Analyst Initial: MS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	-0.001	1	-0.7	0.8 U ✓	
2	**Laboratory Control**	B-02	0.069 ✓	1	7.1	7.1	pink
3	1N3A	B-03	-0.005	1	-1.2	0.8 U ✓	
4	**1N3A LAB DUP**	B-04	-0.005	1	-1.2	0.8 U ✓	
5	1N3B	B-05	0.003	1	-0.3	0.8 U	
6	1N3C	B-06	0.005	1	-0.1	0.8 U	
7	2B6A	B-07	0.004	1	-0.2	0.8 U	
8	2B6B	B-08	0.003	1	-0.3	0.8 U	
9	2B6C	B-09	0.004	1	-0.2	0.8 U	
10	2B8A	B-10	0.335	1	37.0	37.0	very pink
11	2B8B	B-11	0.010	1	0.5	0.8 U	
12	2B8C	B-12	0.019	1	1.5	1.5	
13	2D6A	B-13	0.040	1	3.9	3.9	pink
14	2D6B	B-14	0.007	1	0.2	0.8 U	
15	2D6C	B-15	0.005	1	-0.1	0.8 U	
16	2J7A	B-16	0.047	1	4.7	4.7	pink
17	2J7B	B-17	0.035	1	3.3	3.3	pink
18	2J7C	B-18	0.195	1	21.3	21.3	very pink
19	2J7B.FD	B-19	0.056	1	5.7	5.7	pink
20	2M8A	B-20	0.516	1	57.4	57.4	dark pink

J, F (row 17)
J, F (row 19)

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/10/02
Lab. Manager Review/~~Initial~~: [signature] Date: 4/10/02

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/8/02____________ **Fraction:__TNT & RDX______________**

Lab:_____Field Lab__________ **Project Name:__Tooele________________**

Reviewer:____RA_____________ **Date:____April 17, 2002_________________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: The %RPD for the field duplicate pair 2J7B/2J7BFD (53%) was greater than the QC limit (i.e., 35%) for RDX in batch B. These results were flagged "J,f" in these samples.

Correctable Anomalies: None.

Comments: It should be noted that some LCS absorbances were less than the lower control limit specified in the method for TNT and RDX. The manufacturer, SDI, was contacted and required to conduct a stability study using the same TNT and RDX standards used in the field. The study indicated that the standard shipped to the field was degraded. URS then required SDI to re-certify the standard. Four replicate analyses were performed, under controlled conditions, of the standard lots in question. The average absorbance +/- 3 X STDEV was used to establish new control limits for the LCS analyses. All absorbances were within the newly established window.

Signed: Ranjan

SDI

Jason Ai
URS Corp.
849 International Drive, Suite 320
Linthicum, MD 21090

Strategic Diagnostics Incorporated
111 Pencader Drive
Newark, DE 19702

Dear Jason,

Thank you for using our Ensys TNT and RDX test kits on your Tooele Project. We truly appreciate doing business with URS, and your office in particular. The Ensys TNT and RDX test kits passed our internal QC and are functioning properly. SDI has recently run both the Ensys TNT and RDX test kits for the lots that you are using and shown that the QA/QC standards are resulting in absorbance values lower than indicated in the User's Guide.

The absorbances that SDI has obtained using a Hach DR2010 for the TNT and RDX standards are:

TNT:	RDX:
0.291	0.171
0.290	0.150
0.265	0.151
0.270	0.141

Based upon the the absorbance values that SDI has provided you, your calculations for the upper control limit and lower control limit for the test kits are correct.

Sincerely,

Rich Quashne
Southeastern Account Manager
Strategic Diagnostics, Inc.
(800) 544-8881 x244
(302) 456-6782 (Fax)
rquashne@sdix.com

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analyte indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
C	For reactive cyanide, MS or LCS recoveries less than 30%, but greater than zero.

The other type of code used by Dames & Moore is a "Reason Code". The reason code indicates the type of quality control failure that lead to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
c	Calibration failure; poor or unstable response	b	Instrument performance failure	c	Calibration failure
d	MS/MSD imprecision	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
e	LCSD imprecision	d	MS/MSD imprecision	e	LCSD imprecision
f	Field duplicate imprecision	e	LCSD imprecision	f	Field duplicate imprecision
h	Holding time violation	f	Field duplicate imprecision	h	Holding time violation
i	Internal standard failure	g	Dual column confirmation imprecision	k	Laboratory duplicate imprecision
j	Poor mass spectrometer performance	h	Holding time violation	l	LCS recovery failure
l	LCS recovery failure	i	Internal standard failure	m	MS/MSD recovery failure
m	MS/MSD recovery failure	l	LCS recovery failure	n	ICS failure
p	Poor chromatography	m	MS/MSD recovery failure	o	Calibration blank contamination
r	linearity failure in initial calibration	p	Poor chromatography	p	Preparation blank contamination
s	Surrogate failure	r	linearity failure in initial calibration	r	Linearity failure in calibration or MSA
t	Tuning failure	s	Surrogate failure	s	Serial dilution failure
w	Identification criteria failure	u	No confirmation column	v	Post-digestion spike failure
x	Field blank contamination	w	Retention time failure	x	Field blank contamination
y	Trip blank contamination	x	Field blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	z	Method blank contamination	Q	Other - see bottom of data report for explanation
Q	Other - see bottom of data report for explanation	Q	Other - see bottom of data report for explanation		
k	Tentatively Identified Compounds (TICs)				

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/8/02 Extraction Kit ID: 7085000 1K1125

Batch Number: A Analyst Initial: MS AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	1T5A	A-03	10.031	50 ml		040802 0732
4	**1T5A LAB DUP**	A-04	9.987	50 ml		Laboratory QC sample
5	1T5B	A-05	10.012	50 ml		40802 0735
6	1T5C	A-06	10.002	50 ml	red/grey	40802 0740
7	1T5C FD	A-07	10.022	50 ml	red/grey	40802 0740
8	1E4A	A-08	10.003	50 ml	grey/brown	40802 0820
9	1E4B	A-09	10.016	50 ml		40802 0822
10	1E4C	A-10	9.989	50 ml		40802 0827
11	1H4A	A-11	9.990	50 ml		40802 0835
12	1H4B	A-12	10.010	50 ml		40802 0837
13	1H4B FD	A-13	10.006	50 ml		40802 0837
14	1H4C	A-14	10.011	50 ml		40802 0842
15	1J3A	A-15	9.990	50 ml	L. grey/brown	40802 0900
16	1J3B	A-16	10.021	50 ml	L. grey/brown	40802 0902
17	1J3C	A-17	10.020	50 ml	L. grey/brown	40802 0908
18	1L3A	A-18	10.008	50 ml	L. grey/brown	40802 0920
19	1L3B	A-19	10.022	50 ml	L. grey/brown	40802 0922
20	1L3C	A-20	10.000	50 ml		40802 0927

Note/Comment:

QA officer Review/Initial: [signature] Date: 4/18/02

Laboratory Manager Review/Initial: [signature] Date: 4/17/02

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date: 4/8/02
Batch Number: A
Wavelength: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID: 7002000 1E1165
Analyst Initial: MS AS
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.002	1	0.1	0.7 U	
2	**Laboratory Control**	A-02	0.002	0.318	1	9.6	**9.6**	
3	1T5A	A-03	0.011	0.100	1	1.7	**1.7**	slight pink
4	**1T5A LAB DUP**	A-04	0.011	0.100	1	1.7	**1.7**	slight pink
5	1T5B	A-05	0.008	0.169	1	4.2	**4.2**	pink
6	1T5C	A-06	0.014	0.242	1	5.8	**5.8**	bubblegum pink
7	1T5C FD	A-07	0.015	0.255	1	6.0	**6.0**	bubblegum pink
8	1E4A	A-08	0.002	0.007	1	0.0	0.7 U	
9	1E4B	A-09	0.002	0.004	1	-0.1	0.7 U	
10	1E4C	A-10	0.002	0.008	1	0.0	0.7 U	
11	1H4A	A-11	0.003	0.013	1	0.0	0.7 U	slight yellow
12	1H4B	A-12	0.002	0.002	1	-0.2	0.7 U	
13	1H4B FD	A-13	0.002	0.003	1	-0.2	0.7 U	
14	1H4C	A-14	0.002	0.002	1	-0.2	0.7 U	very slight yellow
15	1J3A	A-15	0.002	0.002	1	-0.2	0.7 U	
16	1J3B	A-16	0.002	0.008	1	0.0	0.7 U	
17	1J3C	A-17	0.003	0.027	1	0.5	0.7 U	very slight pink
18	1L3A	A-18	0.003	0.021	1	0.3	0.7 U	very slight yellow
19	1L3B	A-19	0.001	0.003	1	0.0	0.7 U	
20	1L3C	A-20	0.010	0.151	1	3.4	**3.4**	

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/18/02
Laboratory Manager Review: [signature] Date: 4/17/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{\text{Abs}-(0.014/2.54)}{0.0225/2.54}$

Analysis Date: 4/8/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: -0.000

RDX Test Kit ID: 7085000 1K1125
Analyst Initial: MS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.004	1	-0.2	0.8 U	
2	**Laboratory Control**	A-02	0.08	1	8.4	**8.4**	
3	1T5A	A-03	1.637	1	184.2	**184.2**	red
4	**1T5A LAB DUP**	A-04	1.225	1	137.7	**137.7**	red
5	1T5B	A-05	0.272	1	30.1	**30.1**	pink
6	1T5C	A-06	0.013	1	0.8	**0.85**	
7	1T5C FD	A-07	0.013	1	0.8	**0.85**	
8	1E4A	A-08	0.005	1	-0.1	0.8 U	
9	1E4B	A-09	0.004	1	-0.2	0.8 U	
10	1E4C	A-10	0.005	1	-0.1	0.8 U	
11	1H4A	A-11	0.004	1	-0.2	0.8 U	
12	1H4B	A-12	0.005	1	-0.1	0.8 U	
13	1H4B FD	A-13	0.006	1	0.1	0.8 U	
14	1H4C	A-14	0.005	1	-0.1	0.8 U	
15	1J3A	A-15	0.004	1	-0.2	0.8 U	
16	1J3B	A-16	0.004	1	-0.2	0.8 U	
17	1J3C	A-17	0.004	1	-0.2	0.8 U	
18	1L3A	A-18	0.006	1	0.1	0.8 U	
19	1L3B	A-19	0.005	1	-0.1	0.8 U	
20	1L3C	A-20	0.005	1	-0.1	0.8 U	

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/18/02
Lab. Manager Review/Initia [signature] Date: 4/17/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/8/02 Extraction Kit ID: 7085000 1K1125

Batch Number: B Analyst Initial: MS AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	1N3A	B-03	10.024	50 ml	grey/brown	040802 0945
4	**1N3A Lab Duplicate**	B-04	10.026	50 ml	grey/brown	Laboratory QC sample
5	1N3B	B-05	10.001	50 ml		040802 0947
6	1N3C	B-06	10.026	50 ml		040802 0952
7	2B6A	B-07	10.028	50 ml	L. grey	040802 1010
8	2B6B	B-08	10.013	50 ml		040802 1012
9	2B6C	B-09	9.999	50 ml		040802 1017
10	2B8A	B-10	10.027	50 ml	grey/brown	040802 1040
11	2B8B	B-11	10.005	50 ml		040802 1042
12	2B8C	B-12	10.009	50 ml		040802 1047
13	2D6A	B-13	10.006	50 ml		040802 1135
14	2D6B	B-14	10.000	50 ml		040802 1137
15	2D6C	B-15	10.018	50 ml		040802 1142
16	2J7A	B-16	10.008	50 ml	grey	040802 1155
17	2J7B	B-17	10.025	50 ml		040802 1157
18	2J7C	B-18	10.025	50 ml		040802 1205
19	2J7B FD	B-19	10.028	50 ml		040802 1157
20	2M8A	B-20	10.007	50 ml	grey/brown	040802 1230

Note/Comment:

QA officer Review/Initial: [signature] Date: 4/18/02

Laboratory Manager Review/Initial: [signature] Date: 4/17/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date: 4/8/02 TNT Test Kit ID: 7002000 1E1165
Batch Number: B Analyst Initial: MS AS
Wavelength: 540 nm Instrument: Hach DR2000
$Abs_{background}$: 0.000 Reporting Limit: 0.7 ppm
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.003	0.001	1	-0.3	0.7 U	
2	**Laboratory Control**	B-02	0.005	0.308	1	8.9	**8.9**	
3	1N3A	B-03	0.007	0.081	1	1.6	**1.6**	slight pink
4	**1N3A LAB DUP**	B-04	0.008	0.091	1	1.8	**1.8**	light pink
5	1N3B	B-05	-0.001	0.002	1	0.2	0.7 U	
6	1N3C	B-06	-0.001	0.002	1	0.2	0.7 U	
7	2B6A	B-07	-0.001	0.019	1	0.7	**0.7**	
8	2B6B	B-08	-0.002	-0.001	1	0.2	0.7 U	
9	2B6C	B-09	-0.002	0.025	1	1.0	**1.0**	
10	2B8A	B-10	0.003	0.025	1	0.4	0.7 U	slight pink
11	2B8B	B-11	-0.002	0.002	1	0.3	0.7 U	
12	2B8C	B-12	-0.002	0.001	1	0.3	0.7 U	
13	2D6A	B-13	0.001	0.023	1	0.6	0.7 U	
14	2D6B	B-14	-0.001	0.010	1	0.4	0.7 U	
15	2D6C	B-15	-0.002	0.003	1	0.3	0.7 U	
16	2J7A	B-16	0.001	0.049	1	1.4	**1.4**	very slight brown/ pink
17	2J7B	B-17	-0.001	0.017	1	0.7	0.7 U	
18	2J7C	B-18	0.000	0.045	1	1.4	**1.4**	light pink
19	2J7B FD	B-19	-0.001	0.020	1	0.7	**0.7**	
20	2M8A	B-20	0.010	0.120	1	2.5	**2.5**	very slight brown/ pink

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/15/02
Laboratory Manager Review [signature] Date: 4/17/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/8/02
Batch Number: B
Wavelength: 510 nm
$Abs_{background}$: -0.000
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

RDX Test Kit ID: 7085000 1K1125
Analyst Initial: MS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	-0.001	1	-0.7	0.8 U	
2	**Laboratory Control**	B-02	0.069	1	7.1	**7.1**	pink
3	1N3A	B-03	-0.005	1	-1.2	0.8 U	
4	**1N3A LAB DUP**	B-04	-0.005	1	-1.2	0.8 U	
5	1N3B	B-05	0.003	1	-0.3	0.8 U	
6	1N3C	B-06	0.005	1	-0.1	0.8 U	
7	2B6A	B-07	0.004	1	-0.2	0.8 U	
8	2B6B	B-08	0.003	1	-0.3	0.8 U	
9	2B6C	B-09	0.004	1	-0.2	0.8 U	
10	2B8A	B-10	0.335	1	37.0	**37.0**	very pink
11	2B8B	B-11	0.010	1	0.5	0.8 U	
12	2B8C	B-12	0.019	1	1.5	**1.5**	
13	2D6A	B-13	0.040	1	3.9	**3.9**	pink
14	2D6B	B-14	0.007	1	0.2	0.8 U	
15	2D6C	B-15	0.005	1	-0.1	0.8 U	
16	2J7A	B-16	0.047	1	4.7	**4.7**	pink
17	2J7B	B-17	0.035	1	3.3	**3.3**	pink J,F
18	2J7C	B-18	0.195	1	21.3	**21.3**	very pink
19	2J7B FD	B-19	0.056	1	5.7	**5.7**	pink J,F
20	2M8A	B-20	0.516	1	57.4	**57.4**	dark pink

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/18/02
Lab. Manager Review/Initia [signature] Date: 4/17/02

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/8/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: -0.000

RDX Test Kit ID: 7085000 1K1125
Analyst Initial: MS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.004	1			
2	**Laboratory Control**	A-02	0.080	1			
3	1T5A	A-03	1.637	1			red
4	**1T5A LAB DUP**	A-04	1.225	1			red
5	1T5B	A-05	0.272	1			pink
6	1T5C	A-06	0.013	1			
7	1T5C FD	A-07	0.013	1			
8	1E4A	A-08	0.005	1			
9	1E4B	A-09	0.004	1			
10	1E4C	A-10	0.005	1			
11	1H4A	A-11	0.004	1			
12	1H4B	A-12	0.005	1			
13	1H4B FD	A-13	0.006	1			
14	1H4C	A-14	0.005	1			
15	1J3A	A-15	0.004	1			
16	1J3B	A-16	0.004	1			
17	1J3C	A-17	0.004	1			
18	1L3A	A-18	0.006	1			
19	1L3B	A-19	0.005	1			
20	1L3C	A-20	0.005	1			

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ____________ Date: ________
Lab. Manager Review/Initia ____________ Date: ________

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Analysis Date: 4/8/02 | TNT Test Kit ID: 7002000 1E1165
Batch Number: A | Analyst Initial: MS AS
Wavelength: 540 nm | Instrument: Hach DR2000
$Abs_{background}$: 0.000 | Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.002	1			
2	**Laboratory Control**	A-02	0.002	0.318	1			
3	1T5A	A-03	0.011	0.100	1			slight pink
4	**1T5A LAB DUP**	A-04	0.011	0.100	1			" "
5	1T5B	A-05	0.008	0.169	1			pink
6	1T5C	A-06	0.014	0.242	1			bubblegum pink
7	1T5C FD	A-07	0.015	0.266	1			bubblegum pink
8	1E4A	A-08	0.002	0.007	1			
9	1E4B	A-09	0.002	0.004	1			
10	1E4C	A-10	0.002	0.008	1			
11	1H4A	A-11	0.003	0.013	1			slight yellow
12	1H4B	A-12	0.002	0.002	1			
13	1H4B FD	A-13	0.002	0.003	1			
14	1H4C	A-14	0.002	0.002	1			very slight yellow
15	1J3A	A-15	0.002	0.002	1			
16	1J3B	A-16	0.002	0.008	1			
17	1J3C	A-17	0.003	0.027	1			very slight pink
18	1L3A	A-18	0.003	0.021	1			very slight yellow
19	1L3B	A-19	0.001	0.003	1			
20	1L3C	A-20	0.010	0.151	1			

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: ______ Date: ______
Laboratory Manager Reviev ______ Date: ______

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/8/02 Extraction Kit ID: 7085000 1K1125

Batch Number: B Analyst Initial: MS AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	1N3A	B-03	10.024	50 ml	grey/brown	040802 0945
4	**1N3A**	B-04	10.026	50 ml	↓	Laboratory QC sample
5	1N3B	B-05	10.001	50 ml		040802 0947
6	1N3C	B-06	10.024	50 ml		040802 0952
7	2B6A	B-07	10.028	50 ml	light grey	040802 1010
8	2B6B	B-08	10.013	50 ml		040802 1012
9	2B6C	B-09	9.999	50 ml		040802 1017
10	2B8A	B-10	10.027	50 ml	grey/brown	040802 1040
11	2B8B	B-11	10.005	50 ml		040802 1042
12	2B8C	B-12	10.009	50 ml		040802 1047
13	2D6A	B-13	10.006	50 ml		040802 1135
14	2D6B	B-14	10.000	50 ml		040802 1137
15	2D6C	B-15	10.018	50 ml		040802 1142
16	2J7A	B-16	10.008	50 ml	grey	040802 1155
17	2J7B	B-17	10.025	50 ml		040802 1157
18	2J7C	B-18	10.025	50 ml		040802 1205
19	2J7B FD	B-19	10.028	50 ml		040802 1157
20	2M8A	B-20	10.007	50 ml	grey/brown	040802 1230

Note/Comment:

QA officer Review/Initial: Date:

Laboratory Manager Review/Initial: Date:

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial} X4)}{0.0323}$

Analysis Date:	4/8/02	TNT Test Kit ID:	7002000 1E1165
Batch Number:	B	Analyst Initial:	MS AS
Wavelength:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.000	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude. clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.003	0.001	1			
2	**Laboratory Control**	B-02	0.005	0.308	1			
3	1N3A	B-03	0.007	0.081	1			~~tiny~~ slight pink
4	**1N3A**	B-04	0.008	0.091	1			Lab Dup light pink
5	1N3B	B-05	-0.001	0.002	1			
6	1N3C	B-06	-0.001	0.002	1			
7	2B6A	B-07	-0.001	0.019	1			
8	2B6B	B-08	-0.002	-0.001	1			
9	2B6C	B-09	-0.002	0.025	1			
10	2B8A	B-10	~~-0.002~~ 0.003	0.025	1			slight pink
11	2B8B	B-11	-0.002	0.002	1			
12	2B8C	B-12	-0.002	0.001	1			
13	2D6A	B-13	0.001	0.023	1			
14	2D6B	B-14	-0.001	0.010	1			
15	2D6C	B-15	-0.002	0.003	1			
16	2J7A	B-16	0.001	0.049	1			very slight brown/pink
17	2J7B	B-17	-0.001	0.017	1			
18	2J7C	B-18	0.000	0.045	1			light pink
19	2J7B FD	B-19	-0.001	0.020	1			
20	2M8A	B-20	0.010	0.120	1			brown/pink, light

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: ____________ Date: ________

Laboratory Manager Reviev ____________ Date: ________

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs-(0.014/2.54)}{0.0225/2.54}$

Analysis Date: 4/8/02
Batch Number: B
Wavelength: 510 nm
$Abs_{background}$: -0.000
(If the reading is greater than ± 0.002 in magnitude. clean cuvettes and redo steps 2a - 2g.)

RDX Test Kit ID: 7085000 1K1125
Analyst Initial: MS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	-0.001	1			
2	**Laboratory Control**	B-02	0.069	1			
3	1N3A	B-03	-0.005	1			
4	**1N3A**	B-04	-0.005	1			
5	1N3B	B-05	0.003	1			
6	1N3C	B-06	0.005	1			
7	2B6A	B-07	0.004	1			
8	2B6B	B-08	0.003	1			
9	2B6C	B-09	0.004	1			
10	2B8A	B-10	0.335	1			
11	2B8B	B-11	0.010	1			
12	2B8C	B-12	0.019	1			
13	2D6A	B-13	0.040	1			
14	2D6B	B-14	0.007	1			
15	2D6C	B-15	0.005	1			
16	2J7A	B-16	0.047	1			
17	2J7B	B-17	0.035	1			
18	2J7C	B-18	0.195	1			
19	2J7B FD	B-19	0.056	1			
20	2M8A	B-20	0.516	1			

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ____________ Date: ________
Lab. Manager Review/Initia ____________ Date: ________

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/9/02____________ **Fraction:__TNT & RDX______________**

Lab:______Field Lab__________ **Project Name:__Tooele________________**

Reviewer:____RA_____________ **Date:____April 10, 2002________________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: None.

Correctable Anomalies: None.

Comments: It should be noted that the detection limit was raised for the RDX analysis in sample IT5B DIL due to dilutions. It should also be noted that TNT results from samples 2R8A, 2R8AFD, 2T8C, 2T8CFD; and RDX results from samples 2R8A, 2R8AFD, 2R8B, and 2T8A need to be diluted and re-analyzed.

Signed: Roshanak Amyan

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/9/02 Extraction Kit ID: 1k1125

Batch Number: A Analyst Initial: AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	2M8B	A-03	10.009	50 ml		040802 1232
4	**2M8B Laboratory Dup**	A-04	10.015	50 ml		Laboratory QC sample
5	2M8C	A-05	10.003	50 ml		040802 1237
6	2R8A	A-06	10.005	50 ml	brown/yellow	040802 1445
7	2R8A FD	A-07	10.006	50 ml	brown/yellow	040802 1445
8	2R8B	A-08	10.014	50 ml		040802 1449
9	2R8C	A-09	10.010	50 ml		040802 1452
10	2R9A	A-10	10.005	50 ml		040802 1520
11	2R9B	A-11	10.005	50 ml		040802 1522
12	2R9C	A-12	10.007	50 ml		040802 1530
13	2P9A	A-13	10.007	50 ml		040802 1410
14	2P9B	A-14	10.018	50 ml		040802 1412
15	2P9C	A-15	10.017	50 ml		040802 1419
16	2L7A	A-16	10.008	50 ml		040802 1615
17	2L7B	A-17	10.004	50 ml		040802 1618
18	2L7C	A-18	10.017	50 ml		040802 1625
19	2T8A	A-19	10.019	50 ml		040802 1550
20	2T8B	A-20	10.006	50 ml	brown/yellow	040802 1552
21	2T8C	A-21	10.009	50 ml	brown	040802 1600
22	2T8C FD	A-22	10.007	50 ml	brown	040802 1600

Note/Comment: Extract for RDX 1T5B dilution is from 04/08/02A batch.

QA officer Review/Initial: Date: 4/10/02

Laboratory Manager Review/Initial: Date: 4/10/02

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATI $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date: 4/9/02
Batch Number: A
Wavelength: 540 nm
$Abs_{background}$: 0.000
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

TNT Test Kit ID: 1E1165
Analyst Initial: MS
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.000	1	0.0	0.7 U ✓	
2	**Laboratory Control**	A-02	0.000	0.311 ✓	1	9.6	9.6	
3	2M8B	A-03	0.001	0.033	1	0.9	0.9	very slight pink
4	**2M8B Lab Dup**	A-04	0.002	0.032	1	0.7	0.7	very slight pink
5	2M8C	A-05	0.007	0.094	1	2.0	2.0	pink
6	2R8A	A-06	0.058	3.518	1	101.7	**101.7**	blood red rerun 5x dil.
7	2R8A FD	A-07	0.062	3.627	1	104.6	**104.6**	blood red rerun 5x dil.
8	2R8B	A-08	0.010	0.177	1	4.2	4.2	pink
9	2R8C	A-09	0.009	0.170	1	4.1	4.1	pink
10	2R9A	A-10	0.004	0.060	1	1.4	1.4	slight pink
11	2R9B	A-11	0.003	0.068	1	1.7	1.7	slight pink
12	2R9C	A-12	0.019	0.272	1	6.1	6.1	pink
13	2P9A	A-13	0.008	0.115	1	2.6	2.6	slight pink
14	2P9B	A-14	0.004	0.134	1	3.7	3.7	slight pink/brown
15	2P9C	A-15	0.009	0.167	1	4.1	4.1	pink
16	2L7A	A-16	0.007	0.076	1	1.5	1.5	very slight pink
17	2L7B	A-17	0.020	0.597	1	16.0	16.0	dark pink
18	2L7C	A-18	0.004	0.167	1	4.7	4.7	pink
19	2T8A	A-19	0.024	0.361	1	8.2	8.2	pink/black
20	2T8B	A-20	0.063	0.646	1	12.2	12.2	light maroon
21	2T8C	A-21	0.115	3.659	1	99.0	**99.0**	dark red rerun 5x dil.
22	2T8C FD	A-22	0.114	3.597	1	97.2	**97.2**	dark red rerun 5x dil.

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/10/02
Laboratory Manager Review/In: [signature] Date: 4/10/02

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{\text{Abs-(0.014/2.54)}}{0.0225/2.54}$

RDX STD Lot#: 35005-24
RDX Test Kit ID: 1K1125
Analyst Initial: AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

Analysis Date: 4/9/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: 0

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	-0.003	1	-1.0	0.8 U	
2	**Laboratory Control**	A-02	0.072	1	7.5	7.5	
3	2M8B	A-03	0.030	1	2.8	2.8	
4	**2M8B Lab Dup**	A-04	0.023	1	2.0	2.0	
5	2M8C	A-05	0.000	1	-0.6	0.8 U	
6	2R8A	A-06	1.270	1	142.1	**142.1**	red
7	2R8A FD	A-07	1.254	1	140.3	**140.3**	red
8	2R8B	A-08	0.444	1	49.3	**49.3**	dark pink
9	2R8C	A-09	0.016	1	1.2	1.2	
10	2R9A	A-10	0.054	1	5.4	5.4	pink
11	2R9B	A-11	0.059	1	6.0	6.0	pink
12	2R9C	A-12	0.008	1	0.3	0.8 U	
13	2P9A	A-13	0.201	1	22.0	22.0	pink
14	2P9B	A-14	1.922	1	215.3	**215.3**	red
15	2P9C	A-15	0.018	1	1.4	1.4	
16	2L7A	A-16	0.129	1	13.9	13.9	pink
17	2L7B	A-17	0.255	1	28.0	28.0	dark pink
18	2L7C	A-18	0.004	1	-0.2	0.8 U	
19	2T8A	A-19	0.910	1	101.6	**101.6**	pink
20	2T8B	A-20	0.003	1	-0.3	0.8 U	
21	2T8C	A-21	0.016	1	1.2	1.2	yellow
22	2T8C FD	A-22	0.016	1	1.2	1.2	yellow
23	1T5B DIL	A-23	0.032	2	6.0	6.0	pink

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/10/02
Lab. Manager Review/Initia [signature] Date: 4/10/02

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/9/02_____________ **Fraction:__TNT & RDX______________**

Lab:______Field Lab__________ **Project Name:__Tooele_________________**

Reviewer:____RA_____________ **Date:____April 17, 2002_________________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: None.

Correctable Anomalies: None.

Comments: It should be noted that some LCS absorbances were less than the lower control limit specified in the method for TNT and RDX. The manufacturer, SDI, was contacted and required to conduct a stability study using the same TNT and RDX standards used in the field. The study indicated that the standard shipped to the field was degraded. URS then required SDI to re-certify the standard. Four replicate analyses were performed, under controlled conditions, of the standard lots in question. The average absorbance +/- 3 X STDEV was used to establish new control limits for the LCS analyses. All absorbances were within the newly established window. It should also be noted that TNT results from samples 2R8A, 2R8AFD, 2T8C, 2T8CFD; and RDX results from samples 2R8A, 2R8AFD, 2R8B, and 2T8A need to be diluted and re-analyzed. These results will be provided in a later batch.

Signed: Ranjan

Jason Ai
URS Corp.
849 International Drive, Suite 320
Linthicum, MD 21090

Strategic Diagnostics Incorporated
111 Pencader Drive
Newark, DE 19702

Dear Jason,

Thank you for using our Ensys TNT and RDX test kits on your Tooele Project. We truly appreciate doing business with URS, and your office in particular. The Ensys TNT and RDX test kits passed our internal QC and are functioning properly. SDI has recently run both the Ensys TNT and RDX test kits for the lots that you are using and shown that the QA/QC standards are resulting in absorbance values lower than indicated in the User's Guide.

The absorbances that SDI has obtained using a Hach DR2010 for the TNT and RDX standards are:

TNT:	RDX:
0.291	0.171
0.290	0.150
0.265	0.151
0.270	0.141

Based upon the the absorbance values that SDI has provided you, your calculations for the upper control limit and lower control limit for the test kits are correct.

Sincerely,

Rich Quashne
Southeastern Account Manager
Strategic Diagnostics, Inc.
(800) 544-8881 x244
(302) 456-6782 (Fax)
rquashne@sdix.com

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/9/02 Extraction Kit ID: 1k1125

Batch Number: A Analyst Initial: AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	2M8B	A-03	10.009	50 ml		040802 1232
4	**2M8B Laboratory Dup**	A-04	10.015	50 ml		Laboratory QC sample
5	2M8C	A-05	10.003	50 ml		040802 1237
6	2R8A	A-06	10.005	50 ml	brown/yellow	040802 1445
7	2R8A FD	A-07	10.006	50 ml	brown/yellow	040802 1445
8	2R8B	A-08	10.014	50 ml		040802 1449
9	2R8C	A-09	10.010	50 ml		040802 1452
10	2R9A	A-10	10.005	50 ml		040802 1520
11	2R9B	A-11	10.005	50 ml		040802 1522
12	2R9C	A-12	10.007	50 ml		040802 1530
13	2P9A	A-13	10.007	50 ml		040802 1410
14	2P9B	A-14	10.018	50 ml		040802 1412
15	2P9C	A-15	10.017	50 ml		040802 1419
16	2L7A	A-16	10.008	50 ml		040802 1615
17	2L7B	A-17	10.004	50 ml		040802 1618
18	2L7C	A-18	10.017	50 ml		040802 1625
19	2T8A	A-19	10.019	50 ml		040802 1550
20	2T8B	A-20	10.006	50 ml	brown/yellow	040802 1552
21	2T8C	A-21	10.009	50 ml	brown	040802 1600
22	2T8C FD	A-22	10.007	50 ml	brown	040802 1600

Note/Comment: Extract for RDX 1T5B dilution is from 04/08/02A batch.

QA officer Review/Initial: Date: 4/17/02

Laboratory Manager Review/Initial: Date: 4/17/02

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date: 4/9/02
Batch Number: A
Wavelength: 540 nm
$Abs_{background}$: 0.000
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

TNT Test Kit ID: 1E1165
Analyst Initial: MS
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.000	1	0.0	0.7 U	
2	**Laboratory Control**	A-02	0.000	0.311	1	9.6	**9.6**	
3	2M8B	A-03	0.001	0.033	1	0.9	**0.9**	very slight pink
4	**2M8B Lab Dup**	A-04	0.002	0.032	1	0.7	**0.7**	very slight pink
5	2M8C	A-05	0.007	0.094	1	2.0	**2.0**	pink
6	2R8A	A-06	0.058	3.518	1	101.7	**101.7**	blood red rerun 5x dil.
7	2R8A FD	A-07	0.062	3.627	1	104.6	**104.6**	blood red rerun 5x dil.
8	2R8B	A-08	0.010	0.177	1	4.2	**4.2**	pink
9	2R8C	A-09	0.009	0.170	1	4.1	**4.1**	pink
10	2R9A	A-10	0.004	0.060	1	1.4	**1.4**	slight pink
11	2R9B	A-11	0.003	0.068	1	1.7	**1.7**	slight pink
12	2R9C	A-12	0.019	0.272	1	6.1	**6.1**	pink
13	2P9A	A-13	0.008	0.115	1	2.6	**2.6**	slight pink
14	2P9B	A-14	0.004	0.134	1	3.7	**3.7**	slight pink/brown
15	2P9C	A-15	0.009	0.167	1	4.1	**4.1**	pink
16	2L7A	A-16	0.007	0.076	1	1.5	**1.5**	very slight pink
17	2L7B	A-17	0.020	0.597	1	16.0	**16.0**	dark pink
18	2L7C	A-18	0.004	0.167	1	4.7	**4.7**	pink
19	2T8A	A-19	0.024	0.361	1	8.2	**8.2**	pink/black
20	2T8B	A-20	0.063	0.646	1	12.2	**12.2**	light maroon
21	2T8C	A-21	0.115	3.659	1	99.0	**99.0**	dark red rerun 5x dil.
22	2T8C FD	A-22	0.114	3.597	1	97.2	**97.2**	dark red rerun 5x dil.

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: [signature] Date: 4/13/02
Laboratory Manager Revie[signature] Date: 4/17/02

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs-(0.014/2.54)}{0.0225/2.54}$

Analysis Date:	4/9/02	RDX STD Lot#:	35005-24
Batch Number:	A	RDX Test Kit ID:	1K1125
Wavelength:	510 nm	Analyst Initial:	AS
$Abs_{background}$:	0	Instrument:	Spectro 22
		Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	-0.003	1	-1.0	0.8 U	
2	**Laboratory Control**	A-02	0.072	1	7.5	**7.5**	
3	2M8B	A-03	0.030	1	2.8	**2.8**	
4	**2M8B Lab Dup**	A-04	0.023	1	2.0	**2.0**	
5	2M8C	A-05	0.000	1	-0.6	0.8 U	
6	2R8A	A-06	1.270	1	142.1	**142.1**	red
7	2R8A FD	A-07	1.254	1	140.3	**140.3**	red
8	2R8B	A-08	0.444	1	49.3	**49.3**	dark pink
9	2R8C	A-09	0.016	1	1.2	**1.2**	
10	2R9A	A-10	0.054	1	5.4	**5.4**	pink
11	2R9B	A-11	0.059	1	6.0	**6.0**	pink
12	2R9C	A-12	0.008	1	0.3	0.8 U	
13	2P9A	A-13	0.201	1	22.0	**22.0**	pink
14	2P9B	A-14	1.922	1	215.3	**215.3**	red
15	2P9C	A-15	0.018	1	1.4	**1.4**	
16	2L7A	A-16	0.129	1	13.9	**13.9**	pink
17	2L7B	A-17	0.255	1	28.0	**28.0**	dark pink
18	2L7C	A-18	0.004	1	-0.2	0.8 U	
19	2T8A	A-19	0.910	1	101.6	**101.6**	pink
20	2T8B	A-20	0.003	1	-0.3	0.8 U	
21	2T8C	A-21	0.016	1	1.2	**1.2**	yellow
22	2T8C FD	A-22	0.016	1	1.2	**1.2**	yellow
23	1T5B DIL	A-23	0.032	2	6.0	**6.0**	pink

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: [signature] Date: 4/18/02

Lab. Manager Review/Initia [signature] Date: 4/17/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/9/02 Extraction Kit ID: [illegible]

Batch Number: A Analyst Initial: AS [illegible]

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	2M8B	A-03	[illegible]	50 ml		040802 1232
4	**2M8B Laboratory Dup**	A-04	10.015	50 ml		Laboratory QC sample
5	2M8C	A-05	10.003	50 ml		040802 1237
6	2R8A	A-06	10.005	50 ml	brown/yellow	040802 1445
7	2R8A FD	A-07	10.006	50 ml	brown/yellow	040802 1445
8	2R8B	A-08	10.014	50 ml		040802 1449
9	2R8C	A-09	10.010	50 ml		040802 1452
10	2R9A	A-10	10.005	50 ml		040802 1520
11	2R9B	A-11	10.005	50 ml		040802 1522
12	2R9C	A-12	10.007	50 ml		040802 1530
13	2P9A	A-13	10.007	50 ml		040802 1410
14	2P9B	A-14	10.018	50 ml		040802 1412
15	2P9C	A-15	10.017	50 ml		040802 1419
16	2L7A	A-16	10.008	50 ml		040802 1615
17	2L7B	A-17	10.004	50 ml		040802 1618
18	2L7C	A-18	10.017	50 ml		040802 1625
19	2T8A	A-19	10.019	50 ml		040802 1550
20	2T8B	A-20	10.006	50 ml	brown/yellow	040802 1552

Note/Comment: 21 | 2T8C | A 21 | 10.009 | 50 ml | brown | 040802 1600

22 | 2T8C FD | A 22 | 10.0[illegible] | 50 ml | brown | 040802 1600

QA officer Review/Initial: ____________ Date: ________

Laboratory Manager Review/Initial: ____________ Date: ________

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs-(0.014/2.54)}{0.0225/2.54}$

Analysis Date:	4/9/02	RDX STD Lot#:	35005-24
Batch Number:	A	RDX Test Kit ID:	1K1125
Wavelength:	510 nm	Analyst Initial:	AS
		Instrument:	Spectro 22
$Abs_{background}$:	0	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	-0.003	1			
2	**Laboratory Control**	A-02	0.072	1			
3	2M8B	A-03	0.030	1			
4	**2M8B Lab Dup**	A-04	0.023	1			
5	2M8C	A-05	0.000	1			
6	2R8A	A-06	1.270	1			red
7	2R8A FD	A-07	1.254	1			red
8	2R8B	A-08	0.444	1			dark pink
9	2R8C	A-09	0.016	1			
10	2R9A	A-10	0.054	1			pink
11	2R9B	A-11	0.059	1			pink
12	2R9C	A-12	0.008	1			
13	2P9A	A-13	0.201	1			pink
14	2P9B	A-14	1.922	1			red
15	2P9C	A-15	0.018	1			
16	2L7A	A-16	0.129	1			pink
17	2L7B	A-17	0.255	1			dark pink
18	2L7C	A-18	0.004	1			
19	2T8A	A-19	0.910	1			pink
20	2T8B	A-20	0.003	1			
21	2T8C	A-21	0.016	1			yellow
22	2T8C FD	A-22	0.016	1			yellow
23	1T5B DIL	A-23	0.032	2			pink

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ________ Date: ______

Lab. Manager Review/Initia ________ Date: ______

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial} X4)}{0.0323}$

Analysis Date:	4/9/02	TNT Test Kit ID:	1E1165
Batch Number:	A	Analyst Initial:	MS
Wavelength:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.000	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.000	0.000	1			
2	**Laboratory Control**	A-02	0.000	0.311	1			
3	2M8B	A-03	0.001	0.033	1			very slight pink
4	**2M8B Lab Dup**	A-04	0.002	0.032	1			"
5	2M8C	A-05	0.007	0.094	1			pink
6	2R8A	A-06	0.058	3.518	1			blood red 5x
7	2R8A FD	A-07	0.062	3.627	1			" 5x
8	2R8B	A-08	0.010	0.177	1			pink
9	2R8C	A-09	0.009	0.170	1			pink
10	2R9A	A-10	0.004	0.060	1			slight pink
11	2R9B	A-11	0.003	0.068	1			"
12	2R9C	A-12	0.019	0.272	1			pink
13	2P9A	A-13	0.008	0.115	1			slight pink
14	2P9B	A-14	0.004	0.134	1			slight brown/pink
15	2P9C	A-15	0.009	0.167	1			pink
16	2L7A	A-16	0.007	0.076	1			very slight pink
17	2L7B	A-17	0.020	0.597	1			dark pink
18	2L7C	A-18	0.004	0.167	1			pink
19	2T8A	A-19	0.024	0.361	1			~~dark~~ pink/~~red~~ black
20	2T8B	A-20	0.063	0.646	1			light maroon
21	2T8C	A-21	0.115	3.659	1			dark red 5x
22	2T8C FD	A-22	0.114	3.597	1			dark red 5x

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.

2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: ____________ Date: ________

Laboratory Manager Reviev ____________ Date: ________

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/10/02____________ **Fraction:**__TNT & RDX______________

Lab:______Field Lab__________ **Project Name:**__Tooele________________

Reviewer:____RA______________ **Date:**____April 18, 2002________________

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: The RDX results were over the linear range in the laboratory duplicate pair 2U9A/2U9A Lab Dup in batch B. These samples were re-analyzed at different dilutions on 4/11/01. No data qualifying action was required.

Correctable Anomalies: None.

Comments: It should be noted that some LCS absorbances were less than the lower control limit specified in the method for TNT and RDX. The manufacturer, SDI, was contacted and required to conduct a stability study using the same TNT and RDX standards used in the field. The study indicated that the standard shipped to the field was degraded. URS then required SDI to re-certify the standard. Four replicate analyses were performed, under controlled conditions, of the standard lots in question. The average absorbance +/- 3 X STDEV was used to establish new control limits for the LCS analyses. All absorbances were within the newly established window. It should also be noted that TNT results from samples 2U6A, 2U6B, 2R8ADL, and 2R8AFDDL need to be diluted and re-analyzed. These results will be provided in a later batch.

Signed: R Aryan

SDI

Jason Ai
URS Corp.
849 International Drive, Suite 320
Linthicum, MD 21090

Strategic Diagnostics Incorporated
111 Pencader Drive
Newark, DE 19702

Dear Jason,

Thank you for using our Ensys TNT and RDX test kits on your Tooele Project. We truly appreciate doing business with URS, and your office in particular. The Ensys TNT and RDX test kits passed our internal QC and are functioning properly. SDI has recently run both the Ensys TNT and RDX test kits for the lots that you are using and shown that the QA/QC standards are resulting in absorbance values lower than indicated in the User's Guide.

The absorbances that SDI has obtained using a Hach DR2010 for the TNT and RDX standards are:

TNT:	RDX:
0.291	0.171
0.290	0.150
0.265	0.151
0.270	0.141

Based upon the the absorbance values that SDI has provided you, your calculations for the upper control limit and lower control limit for the test kits are correct.

Sincerely,

Rich Quashne
Southeastern Account Manager
Strategic Diagnostics, Inc.
(800) 544-8881 x244
(302) 456-6782 (Fax)
rquashne@sdix.com

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analyte indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
C	For reactive cyanide, MS or LCS recoveries less than 30%, but greater than zero.

The other type of code used by Dames & Moore is a "Reason Code". The reason code indicates the type of quality control failure that lead to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
c	Calibration failure; poor or unstable response	b	Instrument performance failure	c	Calibration failure
d	MS/MSD imprecision	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
e	LCSD imprecision	d	MS/MSD imprecision	e	LCSD imprecision
f	Field duplicate imprecision	e	LCSD imprecision	f	Field duplicate imprecision
h	Holding time violation	f	Field duplicate imprecision	h	Holding time violation
i	Internal standard failure	g	Dual column confirmation imprecision	k	Laboratory duplicate imprecision
j	Poor mass spectrometer performance	h	Holding time violation	l	LCS recovery failure
l	LCS recovery failure	i	Internal standard failure	m	MS/MSD recovery failure
m	MS/MSD recovery failure	l	LCS recovery failure	n	ICS failure
p	Poor chromatography	m	MS/MSD recovery failure	o	Calibration blank contamination
r	linearity failure in initial calibration	p	Poor chromatography	p	Preparation blank contamination
s	Surrogate failure	r	linearity failure in initial calibration	r	Linearity failure in calibration or MSA
t	Tuning failure	s	Surrogate failure	s	Serial dilution failure
w	Identification criteria failure	u	No confirmation column	v	Post-digestion spike failure
x	Field blank contamination	w	Retention time failure	x	Field blank contamination
y	Trip blank contamination	x	Field blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	z	Method blank contamination	Q	Other - see bottom of data report for explanation
Q	Other - see bottom of data report for explanation	Q	Other - see bottom of data report for explanation		
k	Tentatively Identified Compounds (TICs)				

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/10/02 Extraction Kit ID: 1K1125

Batch Number: A Analyst Initial: MS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	2U4A	A-03	10.018	50 ml		041002 0747
4	**2U4A LAB DUP**	A-04	10.021	50 ml		Laboratory QC sample
5	2U4B	A-05	9.991	50 ml		041002 0747
6	2U4B FD	A-06	10.009	50 ml		041002 0747
7	2U4C	A-07	9.994	50 ml		041002 0752
8	2U6A	A-08	10.026	50 ml		041002 0805
9	2U6B	A-09	10.011	50 ml		041002 0807
10	2U6C	A-10	10.010	50 ml		041002 0812
11	3Q10A	A-11	10.017	50 ml		041002 0830
12	3Q10B	A-12	10.012	50 ml		041002 0832
13	3Q10C	A-13	10.026	50 ml		041002 0838
14	3O10A	A-14	10.001	50 ml		041002 0910
15	3O10B	A-15	10.034	50 ml		041002 0912
16	3O10C	A-16	10.013	50 ml		041002 0918
17	3N9A	A-17	9.990	50 ml		041002 0935
18	3N9B	A-18	10.033	50 ml		041002 0937
19	3N9C	A-19	10.019	50 ml		041002 0942
20	3O10B FD	A-20	10.005	50 ml		041002 0912

Note/Comment:

QA officer Review/Initial: Date: 4/18/02

Laboratory Manager Review/Initial Date: 4/17/02

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date: 4/10/02
Batch Number: A
Wavelength: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID:
Analyst Initial: MS
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.002	0.003	1	-0.2	0.7 U	
2	**Laboratory Control**	A-02	0.002	0.307	1	9.3	**9.3**	
3	2U4A	A-03	0.016	0.126	1	1.9	**1.9**	light pink
4	**2U4A LAB DUP**	A-04	0.016	0.132	1	2.1	**2.1**	light pink
5	2U4B	A-05	0.004	0.002	1	-0.4	0.7 U	
6	2U4B FD	A-06	0.003	0.001	1	-0.3	0.7 U	
7	2U4C	A-07	0.022	0.188	1	3.1	**3.1**	pink
8	2U6A	A-08	0.030	1.155	1	32.0	**32.0**	dark pink need 2x dil.
9	2U6B	A-09	0.106	2.972	1	78.9	**78.9**	red need 50x dil.
10	2U6C	A-10	0.072	1.001	1	22.1	**22.1**	dark pink
11	3Q10A	A-11	0.000	0.015	1	0.5	0.7 U	light yellow
12	3Q10B	A-12	0.001	0.011	1	0.2	0.7 U	
13	3Q10C	A-13	0.006	0.057	1	1.0	**1.0**	light pink
14	3O10A	A-14	0.000	0.025	1	0.8	**0.8**	
15	3O10B	A-15	0.002	0.014	1	0.2	0.7 U	lemon yellow
16	3O10C	A-16	0.005	0.088	1	2.1	**2.1**	light pink
17	3N9A	A-17	0.004	0.035	1	0.6	0.7 U	very slight pink
18	3N9B	A-18	0.006	0.060	1	1.1	**1.1**	slight pink
19	3N9C	A-19	0.006	0.055	1	1.0	**1.0**	slight pink
20	3O10B FD	A-20	0.001	0.012	1	0.2	0.7 U	
21	2R8A DL	A-21	0.022	1.080	5	153.6	**153.6**	red need 10x dil.
22	2R8A FD DL	A-22	0.027	1.619	5	233.9	**233.9**	red need 10x dil.
23	2T8C DL	A-23	0.036	3.016	5	444.6	**444.6**	dark red need 100x dil.

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

* Dilution data were in 4/11/02 Batch A.

QA officer Review/Initial: Date: 4/18/02
Laboratory Manager Review/Init Date: 4/17/02

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/10/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: 0.001

RDX Test Kit ID: 1K1125
Analyst Initial: AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.004	1	-0.2	0.8 U	
2	**Laboratory Control**	A-02	0.069	1	7.2	**7.2**	
3	2U4A	A-03	0.003	1	-0.3	0.8 U	
4	**2U4A LAB DUP**	A-04	0.003	1	-0.3	0.8 U	
5	2U4B	A-05	0.002	1	-0.4	0.8 U	
6	2U4B FD	A-06	0.003	1	-0.3	0.8 U	
7	2U4C	A-07	0.005	1	-0.1	0.8 U	
8	2U6A	A-08	0.406	1	45.2	**45.2**	See Dilution
9	2U6B	A-09	0.016	1	1.2	**1.2**	
10	2U6C	A-10	0.008	1	0.3	0.8 U	
11	3Q10A	A-11	0.002	1	-0.4	0.8 U	
12	3Q10B	A-12	0.002	1	-0.4	0.8 U	
13	3Q10C	A-13	0.003	1	-0.3	0.8 U	
14	3O10A	A-14	0.002	1	-0.4	0.8 U	
15	3O10B	A-15	0.003	1	-0.3	0.8 U	
16	3O10C	A-16	0.003	1	-0.3	0.8 U	
17	3N9A	A-17	0.002	1	-0.4	0.8 U	
18	3N9B	A-18	0.002	1	-0.4	0.8 U	
19	3N9C	A-19	0.004	1	-0.2	0.8 U	
20	3O10B FD	A-20	0.002	1	-0.4	0.8 U	

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

* Dilution data in 4/11/02 Batch B.

QA officer Review/Initial: [signature] Date: 4/18/02
Lab. Manager Review/Initia [signature] Date: 4/17/02

Extraction Log - TNT and RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Extraction Date: 4/10/02 Extraction Kit ID: 1E1167

Batch Number: B Analyst Initial: MS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	2U9A	B-03	10.002	50 ml	green/ brown	041002 0950
4	**2U9A Lab Dup**	B-04	10.003	50 ml	green/ brown	Laboratory QC sample
5	2U9B	B-05	10.023	50 ml		041002 0952
6	2U9C	B-06	10.006	50 ml		041002 0957
7	3A9A	B-07	10.021	50 ml	light grey	041002 1050
8	3A9A FD	B-08	10.01	50 ml	light grey	041002 1050
9	3A9B	B-09	9.997	50 ml		041002 1055
10	3A9C	B-10	10.019	50 ml		041002 1058
11	3A7A	B-11	9.994	50 ml	light grey	041002 1105
12	3A7B	B-12	10.015	50 ml		041002 1107
13	3A7C	B-13	10.025	50 ml		041002 1112
14	3C9A	B-14	10.017	50 ml		041002 1010
15	3C9B	B-15	10.017	50 ml		041002 1012
16	3C9C	B-16	10.021	50 ml		041002 1018
17	3V5A	B-17	10.005	50 ml		041002 1343
18	3V5B	B-18	10.029	50 ml		041002 1350
19	3V5C	B-19	10.010	50 ml		041002 1352
20	3V7A	B-20	10.008	50 ml	brown/ green	041002 1402

Note/Comment:

QA officer Review/Initial: Date: 4/18/02

Laboratory Manager Review/Initial Date: 4/17/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial}X4)}{0.0323}$

Analysis Date:	4/10/02	TNT Test Kit ID:	1E1167
Batch Number:	B	Analyst Initial:	MS
Wavelength:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.000	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.000	0.001	1	0.0	0.7 U	
2	**Laboratory Control**	B-02	0.000	0.301	1	9.3	**9.3**	See Re-run data below.
3	2U9A	B-03	0.049	0.877	1	21.1	**21.1**	light brown/red
4	**2U9A Lab Dup**	B-04	0.050	0.882	1	21.1	**21.1**	light brown/red
5	2U9B	B-05	0.015	0.296	1	7.3	**7.3**	pink
6	2U9C	B-06	0.018	0.240	1	5.2	**5.2**	pink
7	3A9A	B-07	0.006	0.071	1	1.5	**1.5**	slight brown/yellow
8	3A9A FD	B-08	0.005	0.069	1	1.5	**1.5**	v. slight pink/brown
9	3A9B	B-09	-0.002	0.000	1	0.2	0.7 U	
10	3A9C	B-10	-0.002	0.002	1	0.3	0.7 U	
11	3A7A	B-11	0.016	0.057	1	-0.2	0.7 U	slight brown/yellow
12	3A7B	B-12	-0.002	0.001	1	0.3	0.7 U	
13	3A7C	B-13	-0.002	-0.001	1	0.2	0.7 U	
14	3C9A	B-14	-0.002	0.038	1	1.4	**1.4**	v. slight pink/brown
15	3C9B	B-15	-0.002	-0.003	1	0.2	0.7 U	
16	3C9C	B-16	-0.002	0.002	1	0.3	0.7 U	v. slight yellow
17	3V5A	B-17	0.001	0.011	1	0.2	0.7 U	
18	3V5B	B-18	0.000	0.019	1	0.6	0.7 U	slight pink
19	3V5C	B-19	0.002	0.060	1	1.6	**1.6**	pink
20	3V7A	B-20	0.020	1.046	1	29.9	**29.9**	red
21	2T8C FD DL	B-21	0.039	3.253	5	479.4	**479.4**	red need 50x dil.

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.

2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

* Lab control was reanalyzed and had initial abs: 0.000 and sample abs: 0.330, which meets criteria ✓

** Dilution data were in 4/11/02 Batch A.

QA officer Review/Initial: [signature] Date: 4/18/02

Laboratory Manager Revie [signature] Date: 4/17/02

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs-(0.014/2.54)}{0.0225/2.54}$

Analysis Date:	4/10/02	RDX Test Kit ID:	1K1125
Batch Number:	B	Analyst Initial:	AS
Wavelength:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:		Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.002	1	-0.4	0.8 U	
2	**Laboratory Control**	B-02	0.059	1	6.0	**6.0**	
3	2U9A	B-03	1.931	1	217.4	**217.4**	See dilution
4	**2U9A Lab Dup**	B-04	1.178	1	132.4	**132.4**	See dilution
5	2U9B	B-05	0.022	1	1.9	**1.9**	
6	2U9C	B-06	0.028	1	2.5	**2.5**	
7	3A9A	B-07	0.002	1	-0.4	0.8 U	
8	3A9A FD	B-08	0.002	1	-0.4	0.8 U	
9	3A9B	B-09	0.002	1	-0.4	0.8 U	
10	3A9C	B-10	0.002	1	-0.4	0.8 U	
11	3A7A	B-11	0.002	1	-0.4	0.8 U	
12	3A7B	B-12	0.003	1	-0.3	0.8 U	
13	3A7C	B-13	0.002	1	-0.4	0.8 U	
14	3C9A	B-14	0.003	1	-0.3	0.8 U	
15	3C9B	B-15	0.003	1	-0.3	0.8 U	
16	3C9C	B-16	0.002	1	-0.4	0.8 U	
17	3V5A	B-17	0.003	1	-0.3	0.8 U	
18							
19							
20							

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

* Due to short pf test kit components (used on a previous batch), samples 3V5B, 3V5C, and 3V7A were analyzed in 4/11/02 batch B.

** Dilution data were in 4/11/02 batch B.

QA officer Review/Initial: [signature] Date: 4/18/02

Lab. Manager Review/Initia [signature] Date: 4/17/02

Extraction Log - TNT and RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

Extraction Date: -/10/02 Extraction Kit ID: ____________

Batch Number: A Analyst Initial: ____________

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	2U4A	A-03	10.018	50 ml	[illegible]	
4	2U4A LD	A-04	10.021	50 ml	↓	Laboratory QC sample
5	2U4B	A-05	9.991	50 ml		
6	2U4B FD	A-06	10.009	50 ml		
7	2U4C	A-07	9.994	50 ml	yellow	
8	2U6A	A-08	10.026	50 ml	yellow/brown	
9	2U6B	A-09	10.011	50 ml	red/brown	
10	2U6C	A-10	10.010	50 ml	↓	
11	3Q10A	A-11	10.017	50 ml		
12	3Q10B	A-12	10.012	50 ml		
13	3Q10C	A-13	10.026	50 ml		
14	3O10A	A-14	10.001	50 ml		
15	3O10B	A-15	10.034	50 ml		
16	3O10C	A-16	10.013	50 ml		
17	3N9A	A-17	9.950	50 ml		
18	3N9B	A-18	10.033	50 ml		
19	3N9C	A-19	10.019	50 ml		
20	3O10B FD	A-20	10.005	50 ml		

Note/Comment:

QA officer Review/Initial: ____________ Date: ________

Laboratory Manager Review/Initial ____________ Date: ________

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/10/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: 0.001
(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

RDX Test Kit ID: 1K1125
Analyst Initial: AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.004	1			
2	**Laboratory Control**	A-02	0.069	1			
3	2U4A	A-03	0.003	1			
4	**2U4A LAB DUP**	A-04	0.003	1			
5	2U4B	A-05	0.002	1			
6	2U4B FD	A-06	0.003	1			
7	2U4C	A-07	0.005	1			
8	2U6A	A-08	0.406	1			
9	2U6B	A-09	0.016	1			
10	2U6C	A-10	0.005	1			
11	3Q10A	A-11	0.002	1			
12	3Q10B	A-12	0.002	1			
13	3Q10C	A-13	0.003	1			
14	3O10A	A-14	0.002	1			
15	3O10B	A-15	0.003	1			
16	3O10C	A-16	0.003	1			
17	3N9A	A-17	0.002	1			
18	3N9B	A-18	0.002	1			
19	3N9C	A-19	0.004	1			
20	3O10B FD	A-20	0.002	1			

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ______________ Date: ________
Lab. Manager Review/Initia______________ Date: ________

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample}-(Abs_{initial} X4)}{0.0323}$

Analysis Date: 4/10/02

Batch Number: A

Wavelength: 540 nm

$Abs_{background}$: 0.000

TNT Test Kit ID:

Analyst Initial: MS

Instrument: Hach DR2000

Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.002	0.003	1	-0.2	0.7 U	
2	**Laboratory Control**	A-02	0.002	0.307	1			
3	2U4A	A-03	0.016	0.126	5 1			light pink
4	**2U4A LAB DUP**	A-04	0.016	0.132	5 1			''
5	2U4B	A-05	0.004	0.002	5 1			
6	2U4B FD	A-06	0.003	0.001	5 1			
7	2U4C	A-07	0.022	0.158	1			pink
8	2U6A	A-08	0.030	1.155	1			dark pink
9	2U6B	A-09	0.106	2.472	1			red
10	2U6C	A-10	0.072	1.001	1			medium pink
11	3Q10A	A-11	0.000	0.015	1			light yellow
12	3Q10B	A-12	0.001	0.011	1			
13	3Q10C	A-13	0.006	0.057	1			light pink
14	3O10A	A-14	0.000	0.025	1			
15	3O10B	A-15	0.002	0.014	1			lemon yellow
16	3O10C	A-16	0.005	0.038	1			light pink
17	3N9A	A-17	0.004	0.035	1			very slight pink
18	3N9B	A-18	0.006	0.060	1			slight pink
19	3N9C	A-19	0.006	0.055	1			''
20	3O10B FD	A-20	0.001	0.012	1			
21	2R8A DL	A-21	0.022	1.080	5			
22	2R8A FD DL	A-22	0.027	1.619	5			
23	2T8C DL	A-23	0.036	3.016	5			

20x dil

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.

2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA officer Review/Initial: Date:

Laboratory Manager Review/Init Date:

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/10/02 Extraction Kit ID: ______________

Batch Number: B Analyst Initial: ______________

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	2U9A	B-03	10.002	50 ml	[illegible]	041002 0950
4	**2U9A Lab Dup**	B-04	10.003	50 ml	"	Laboratory QC sample
5	2U9B	B-05	10.023	50 ml		041002 0952
6	2U9C	B-06	10.006	50 ml		041002 0957
7	3A9A	B-07	10.021	50 ml	light gray	041002 1050
8	3A9A FD	B-08	10.010	50 ml	"	041002 1050
9	3A9B	B-09	9.997	50 ml		041002 1055
10	3A9C	B-10	10.019	50 ml		041002 1058
11	3A7A	B-11	9.994	50 ml	light gray	041002 1105
12	3A7B	B-12	10.015	50 ml		041002 1107
13	3A7C	B-13	10.025	50 ml		041002 1112
14	3C9A	B-14	10.[illegible]7	50 ml		041002 1010
15	3C9B	B-15	10.017	50 ml		041002 1012
16	3C9C	B-16	10.021	50 ml		041002 1018
17	3V5A	B-17	[illegible].005	50 ml		041002 1343
18	3V5B	B-18	10.029	50 ml		041002 1350
19	~~3V5B~~ 3V5C	B-19	10.010	50 ml		041002 1352
20	3V8A	B-20	[illegible].008	50 ml	brown/green	041002 1402

Note/Comment: ______________________________

QA officer Review/Initial: ______________ Date: ________

Laboratory Manager Review/Initial: ______________ Date: ________

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/10/02
Batch Number: B
Wavelength: 510 nm
$Abs_{background}$: 0.00

RDX Test Kit ID: 1K1125
Analyst Initial: AS AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.002	1			
2	**Laboratory Control**	B-02	0.054	1			
3	2U9A	B-03	1.931	1			dark red
4	**2U9A Lab Dup**	B-04	1.173	1			pink dark
5	2U9B	B-05	0.022	1			pink
6	2U9C	B-06	0.028	1			pink
7	3A9A	B-07	0.002	1			
8	3A9A FD	B-08	0.002	1			
9	3A9B	B-09	0.002	1			
10	3A9C	B-10	0.002	1			
11	3A7A	B-11	0.002	1			
12	3A7B	B-12	0.003	1			
13	3A7C	B-13	0.002	1			
14	3C9A	B-14	0.005	1			
15	3C9B	B-15	0.003	1			
16	3C9C	B-16	0.002	1			
17	3V5A	B-17	0.003	1			
18		B-18		1			
19		B-19		1			
20		B-20		1			

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ____________ Date: ________
Lab. Manager Review/Initia ____________ Date: ________

Calculation Worksheet - TNT Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: $Abs_{sample}-(Abs_{initial}X4)$
0.0323

Analysis Date:	4/10/02	TNT Test Kit ID:	1E1167
Batch Number:	B	Analyst Initial:	MS
Wavelength:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.003	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	Reported	Comments
1	**Method Blank**	B-01	0.009	0.001	1			
2	**Laboratory Control**	B-02	0.000	0.301	1			
3	2U9A	B-03	0.049	0.377	1			[illegible] red
4	**2U9A Lab Dup**	B-04	0.057	0.332	1			"
5	2U9B	B-05	0.015	0.296	1			pink
6	2U9C	B-06	0.018	0.340	1			"
7	3A9A	B-07	0.026	0.071	1			slight brown/yellow
8	3A9A FD	B-08	0.005	0.069	1			very slight pink/brown
9	3A9B	B-09	-0.002	0.000	1			
10	3A9C	B-10	-0.002	0.002	1			
11	3A7A	B-11	0.016	0.057	1			slight brown/yellow
12	3A7B	B-12	-0.002	0.001	1			
13	3A7C	B-13	-0.002	-0.001	1			
14	3C9A	B-14	0.002	0.058	1			v. slight pink/brown
15	3C9B	B-15	-0.002	-0.003	1			
16	3C9C	B-16	-0.002	0.002	1			v. slight yellow
17	3V5A	B-17	0.001	~~0.0~~ 0.020	1			
18	3V5B	B-18	0.000	0.019	1			slight pink
19	3V5C	B-19	0.002	0.000	1			pink
20	3V7A	B-20	0.020	1.046	1			~~[illegible]~~ red
21	2T8C FD DL	B-21			5			

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

Lab Control rerun 0.000 0.330

QA officer Review/Initial: ______ Date: ______
Laboratory Manager Reviev ______ Date: ______

SWMU 10
KR CMS-TEAD
E-215

DATA VALIDATION REPORT - Level III Review

SDG No.:__4/11/02____________ **Fraction:__TNT & RDX______________**

Lab:_____Field Lab_________ **Project Name:__Tooele________________**

Reviewer:____RA____________ **Date:____April 17, 2002______________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Data Review modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: The %RPD for the field duplicate pair 3V7B/3V7BFD was greater than the QC limit (82%) for the RDX analyses in batch A. These samples were re-analyzed at a dilution factor of 5. The %RPD was still greater than the QC limit at 47%. These results were flagged "J,f".

Correctable Anomalies: None.

Comments: It should be noted that some LCS absorbances were less than the lower control limit specified in the method for TNT and RDX. The manufacturer, SDI, was contacted and required to conduct a stability study using the same TNT and RDX standards used in the field. The study indicated that the standard shipped to the field was degraded. URS then required SDI to re-certify the standard. Four replicate analyses were performed, under controlled conditions, of the standard lots in question. The average absorbance +/- 3 X STDEV was used to establish new control limits for the LCS analyses. All absorbances were within the newly established window.

Signed: Rangan

Jason Ai
URS Corp.
849 International Drive, Suite 320
Linthicum, MD 21090

Strategic Diagnostics Incorporated
111 Pencader Drive
Newark, DE 19702

Dear Jason,

Thank you for using our Ensys TNT and RDX test kits on your Tooele Project. We truly appreciate doing business with URS, and your office in particular. The Ensys TNT and RDX test kits passed our internal QC and are functioning properly. SDI has recently run both the Ensys TNT and RDX test kits for the lots that you are using and shown that the QA/QC standards are resulting in absorbance values lower than indicated in the User's Guide.

The absorbances that SDI has obtained using a Hach DR2010 for the TNT and RDX standards are:

TNT:	RDX:
0.291	0.171
0.290	0.150
0.265	0.151
0.270	0.141

Based upon the the absorbance values that SDI has provided you, your calculations for the upper control limit and lower control limit for the test kits are correct.

Sincerely,

Rich Quashne
Southeastern Account Manager
Strategic Diagnostics, Inc.
(800) 544-8881 x244
(302) 456-6782 (Fax)
rquashne@sdix.com

Data Qualifying Codes

Two types of data qualifying codes or flags are applied in the course of the data review. The data validation flags indicate data that are not usable for decision making, more than normally biased and/or variable, or not representative of field conditions. These codes and their definitions are presented below in the hierarchy stipulated in the USEPA National Functional Guidelines for Data Review (September 1994).

Data Validation Flags

Flag	Interpretation
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analyte indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
C	For reactive cyanide, MS or LCS recoveries less than 30%, but greater than zero.

The other type of code used by Dames & Moore is a "Reason Code". The reason code indicates the type of quality control failure that lead to the application of the data validation flag.

Reason Codes

GC/MS Organics		GC and HPLC Organics		Inorganics and Conventionals	
Code	Interpretation	Code	Interpretation	Code	Interpretation
a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence	a	Incorrect or incomplete analytical sequence
c	Calibration failure; poor or unstable response	b	Instrument performance failure	c	Calibration failure
d	MS/MSD imprecision	c	Calibration failure; poor or unstable response	d	MS/MSD imprecision
e	LCSD imprecision	d	MS/MSD imprecision	e	LCSD imprecision
f	Field duplicate imprecision	e	LCSD imprecision	f	Field duplicate imprecision
h	Holding time violation	f	Field duplicate imprecision	h	Holding time violation
i	Internal standard failure	g	Dual column confirmation imprecision	k	Laboratory duplicate imprecision
j	Poor mass spectrometer performance	h	Holding time violation	l	LCS recovery failure
l	LCS recovery failure	i	Internal standard failure	m	MS/MSD recovery failure
m	MS/MSD recovery failure	l	LCS recovery failure	n	ICS failure
p	Poor chromatography	m	MS/MSD recovery failure	o	Calibration blank contamination
r	linearity failure in initial calibration	p	Poor chromatography	p	Preparation blank contamination
s	Surrogate failure	r	linearity failure in initial calibration	r	Linearity failure in calibration or MSA
t	Tuning failure	s	Surrogate failure	s	Serial dilution failure
w	Identification criteria failure	u	No confirmation column	v	Post-digestion spike failure
x	Field blank contamination	w	Retention time failure	x	Field blank contamination
y	Trip blank contamination	x	Field blank contamination	z	Laboratory storage blank contamination
z	Method blank contamination	z	Method blank contamination	Q	Other - see bottom of data report for explanation
Q	Other - see bottom of data report for explanation	Q	Other - see bottom of data report for explanation		
k	Tentatively Identified Compounds (TICs)				

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/11/02 Extraction Kit ID: 1E1165

Batch Number: A Analyst Initial: MS/AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	4V10A	A-03	10.000	50 ml	grey/brown	041002 1407
4	**4V10A LAB DUP**	A-04	10.020	50 ml	grey/brown	Laboratory QC sample
5	3V7B	A-05	10.027	50 ml	grey/yellow	041002 1405
6	3V7B FD	A-06	10.017	50 ml	grey/yellow	041002 1405
7	3V7C	A-07	10.027	50 ml	red/brown	041002 1508
8	4V10B	A-08	9.997	50 ml		041002 1510
9	4V10C	A-09	10.032	50 ml		041002 1515
10	4T10A	A-10	10.000	50 ml		041002 1522
11	4T10B	A-11	10.000	50 ml		041002 1525
12	4T10C	A-12	9.997	50 ml		041002 1527
13	4X6A	A-13	10.029	50 ml		041002 1540
14	4X6B	A-14	10.025	50 ml		041002 1542
15	4X6B FD	A-15	10.025	50 ml		041002 1542
16	4X6C	A-16	9.984	50 ml		041002 1550
17	3V7B	A-17	2.008	50 ml		041002 1405
18	3V7B FD	A-18	2.010	50 ml		041002 1405
19	3V7C	A-19	2.008	50 ml		041002 1508
20						

Note/Comment:

QA officer Review/Initial: Date: 4/18/02

Lab Manager Review/Initial: Date: 4/11/02

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{Abs_{sample} - (Abs_{initial} X4)}{0.0323}$

Analysis Date:	4/11/02	TNT Test Kit ID:	1E1165
Batch Number:	A	Analyst Initial:	MS
Wavelength:	540 nm	Instrument:	Hach DR2000
$Abs_{background}$:	0.000	Reporting Limit:	0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	TNT Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.002	0.001	1	-0.2	0.7 U	
2	**Laboratory Control**	A-02	0.005	0.307	1	8.9	**8.9**	
3	4V10A	A-03	0.014	0.102	1	1.4	**1.4**	slight brown/pink
4	**4V10A LAB DUP**	A-04	0.009	0.073	1	1.1	**1.1**	Lab. Dup.
5	3V7B	A-05	0.024	0.554	1	14.2	**14.2**	dark pink
6	3V7B FD	A-06	0.023	0.5	1	12.6	**12.6**	dark pink
7	3V7C	A-07	0.059	0.747	1	15.8	**15.8**	brown/red
8	4V10B	A-08	0.002	0.005	1	-0.1	0.7 U	
9	4V10C	A-09	-0.004	0.007	1	0.7	**0.7**	
10	4T10A	A-10	0.000	0.009	1	0.3	0.7 U	
11	4T10B	A-11	0.001	0.042	1	1.2	**1.2**	light pink
12	4T10C	A-12	0.003	0.050	1	1.2	**1.2**	light pink
13	4X6A	A-13	0.004	0.032	1	0.5	0.7 U	very slight pink
14	4X6B	A-14	-0.001	-0.006	1	-0.1	0.7 U	
15	4X6B FD	A-15	-0.001	-0.005	1	0.0	0.7 U	
16	4X6C	A-16	-0.001	-0.006	1	-0.1	0.7 U	
17	2T8C FD DL	A-17	0.004	0.338	50	498.5	**498.5**	dark pink
18	2U6A DL	A-18	0.005	0.508	5	75.5	**75.5**	light pink
19	2U6B DL	A-19	0.003	0.082	50	108.4	**108.4**	pink
20	2R8A DL	A-20	0.036	0.657	10	158.8	**158.8**	dark pink
21	2R8A FD DL	A-21	0.014	0.561	10	156.3	**156.3**	dark pink
22	2T8C DL	A-22	0.007	0.348	50	495.4	**495.4**	pink

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

QA Officer Review/Initial: [signature] Date: 4/11/02
Lab Manager Review/Initial: [signature] Date: 4/17/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $\frac{\text{Abs}-(0.014/2.54)}{0.0225/2.54}$

Analysis Date: 4/11/02
Batch Number: A
Wavelength: 510 nm
$Abs_{background}$: 0.001

RDX Test Kit ID: 1K1125
Analyst Initial: AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments	
1	**Method Blank**	A-01	0.001	1	-0.5	0.8 U		
2	**Laboratory Control**	A-02	0.074	1	7.7	7.7		
3	4V10A	A-03	0.059	1	6.0	**6.0**		
4	**4V10A LAB DUP**	A-04	0.070	1	7.3	**7.3**		
5	3V7B	A-05	1.561	1	175.6	**175.6**	See Dilution - A-17	J, F
6	3V7B FD	A-06	0.654	1	73.2	**73.2**	See Dilution - A-18	J, F
7	3V7C	A-07	1.922	1	216.4	**216.4**	See Dilution - A-19	
8	4V10B	A-08	0.007	1	0.2	0.8 U		
9	4V10C	A-09	0.007	1	0.2	0.8 U		
10	4T10A	A-10	0.005	1	-0.1	0.8 U		
11	4T10B	A-11	0.006	1	0.1	0.8 U		
12	4T10C	A-12	0.006	1	0.1	0.8 U		
13	4X6A	A-13	0.004	1	-0.2	0.8 U		
14	4X6B	A-14	0.004	1	-0.2	0.8 U		
15	4X6B FD	A-15	0.004	1	-0.2	0.8 U		
16	4X6C	A-16	0.004	1	-0.2	0.8 U		
17	3V7B	A-17	0.074	5	38.7	**38.7**	J, f	J, F
18	3V7B FD	A-18	0.117	5	62.9	**62.9**	J, f	J, F
19	3V7C	A-19	0.049	10	49.1	**49.1**		
20								

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

* Lab control data was not provided. Will check with analyst and provide the data later.

QA officer Review/Initial: [signature] Date: 4/18/02
Lab. Manager Review/Initia [signature] Date: 4/17/02

SWMU 10
KR CMS-TEAD
E-222

Extraction Log - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: VARIOUS   Extraction Kit ID: 1K1125

Batch Number: B   Analyst Initial: AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	EXTRACT DATE
1	**Method Blank**	B-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	B-02		50 ml		Laboratory QC sample
3	1T5A	B-03	2.000	50 ml		4/9/02
4	**1T5A LAB DUP**	B-04	2.003	50 ml		4/9/02
5	2B8A	B-05	10.027	50 ml		4/8/02
6	2M8A	B-06	10.007	50 ml		4/8/02
7	2R8A	B-07	2.012	50 ml		4/11/02
8	2R8A FD	B-08	1.997	50 ml		4/11/02
9	2R8B	B-09	10.014	50 ml		4/9/02
10	2P9B	B-10	10.018	50 ml		4/9/02
11	2T8A	B-11	10.019	50 ml		4/9/02
12	2U6A	B-12	10.026	50 ml		4/10/02
13	3V7A	B-13	10.008	50 ml		4/10/02
14	3V5B	B-14	10.029	50 ml		4/10/02
15	3V5C	B-15	10.010	50 ml		4/10/02
16	2U9A	B-16	2.002	50 ml		4/10/02
17	2U9A LAB DUP	B-17	2.010	50 ml		4/10/02
18						
19						
20						

Note/Comment: For RDX dilution analysis only

QA officer Review/Initial: [signature]   Date: 4/15/02

Laboratory Manager Review/Initial: [signature]   Date: 4/17/02

Calculation Worksheet - RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date: 4/11/02
Batch Number: B
Wavelength: 510 nm
$Abs_{background}$: 0.001

RDX Test Kit ID: 1K1125
Analyst Initial: AS
Instrument: Spectro 22
Reporting Limit: 0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.001	1	-0.5	0.8 U	
2	**Laboratory Control**	B-02	0.071	1	7.4	**7.4**	
3	1T5A	B-03	0.117	5	62.9	**62.9**	
4	**1T5A LAB DUP**	B-04	0.139	5	75.3	**75.3**	
5	2B8A	B-05	0.125	2	27.0	**27.0**	
6	2M8A	B-06	0.203	2	44.6	**44.6**	
7	2R8A	B-07	0.168	5	91.7	**91.7**	
8	2R8A FD	B-08	0.152	5	82.7	**82.7**	
9	2R8B	B-09	0.144	2	31.3	**31.3**	
10	2P9B	B-10	0.390	10	434.0	**434.0**	
11	2T8A	B-11	0.102	10	108.9	**108.9**	
12	2U6A	B-12	0.082	5	43.2	**43.2**	
13	3V7A	B-13	0.033	2	6.2	**6.2**	
14	3V5B	B-14	0.004	1	-0.2	0.8 U	
15	3V5C	B-15	0.002	1	-0.4	0.8 U	
16	2U9A	B-16	0.208	10	228.6	**228.6**	
17	2U9A LAB Dup	B-17	0.238	10	262.5	**262.5**	
18	2P9B	B-18	0.220	20	484.3	**484.3**	
19							
20							

Notes: 1) Abs for lab control sample must be between 0.045 to 0.075 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA Officer Review/Initial: [signature] Date: 4/18/02
Lab Manager Review/Initial [signature] Date: 4/17/02

Extraction Log - TNT and RDX Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

Extraction Date: 4/11/02 Extraction Kit ID: [illegible]

Batch Number: A Analyst Initial: MS AS

No.	Sample ID	Lab ID	Sample Weight (g)	Solvent Add (mL)	Extract Color	Comment
1	**Method Blank**	A-01		50 ml		Laboratory QC sample
2	**Laboratory Control**	A-02		50 ml		Laboratory QC sample
3	4V10A	A-03	10.000	50 ml		041002 1407
4	**4V10A LAB DUP**	A-04	10.020	50 ml		Laboratory QC sample
5	3V7B	A-05	10.027	50 ml		041002 1405
6	3V7B FD	A-06	10.017	50 ml		041002 1405
7	3V7C	A-07	10.027	50 ml		041002 1508
8	4V10B	A-08	9.997	50 ml		041002 1510
9	4V10C	A-09	10.032	50 ml		041002 1515
10	4T10A	A-10	10.000	50 ml		041002 1522
11	4T10B	A-11	10.002	50 ml		041002 1525
12	4T10C	A-12	9.977	50 ml		041002 1527
13	4X6A	A-13	10.029	50 ml		041002 1540
14	4X6B	A-14	10.025	50 ml		041002 1542
15	4X6B FD	A-15	10.025	50 ml		041002 1542
16	4X6C	A-16	9.984	50 ml		041002 1550
17	3V7B	A-17	10.008	50 ml		
18	3V7B FD	A-18	10.010	50 ml		
19	3V7C	A-19	10.003	50 ml		
20		A-20		50 ml		

Note/Comment:

QA officer Review/Initial: ____________ Date: ________

Laboratory Manager Review/Initial: ____________ Date: ________

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date:	4/11/02	RDX Test Kit ID:	1K1125
Batch Number:	A	Analyst Initial:	AS AS
Wavelength:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	0.001	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	A-01	0.001	1			
2	**Laboratory Control**	A-02	0.074	1			
3	4V10A	A-03	0.059	1			pink
4	**4V10A LAB DUP**	A-04	0.070	1			pink
5	3V7B	A-05	1.561	1			dark red
6	3V7B FD	A-06	1.654	1			dark red
7	3V7C	A-07	1.922	1			cherry red
8	4V10B	A-08	0.007	1			
9	4V10C	A-09	0.007	1			
10	4T10A	A-10	0.005	1			
11	4T10B	A-11	0.006	1			
12	4T10C	A-12	0.006	1			
13	4X6A	A-13	0.004	1			
14	4X6B	A-14	0.004	1			
15	4X6B FD	A-15	0.004	1			
16	4X6C	A-16	0.004	1			
17	3V7B	A-17	0.074	1			
18	3V7B FD	A-18	0.117	1			
19	3V7C	A-19	0.049	1			
20		A-20		1			

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.

2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ____________ Date: ________

Lab. Manager Review/Initia ____________ Date: ________

Calculation Worksheet - TNT Analysis
TNT Washout Facility - SWMU 10
Tooele Army Depot - Tooele, Utah

CALCULATION: $Abs_{sample}-(Abs_{initial}X4)$
0.0323

Analysis Date: 4/11/02
Batch Number: A
Wavelength: 540 nm
$Abs_{background}$: 0.000

TNT Test Kit ID: 161165
Analyst Initial: [illegible]
Instrument: Hach DR2000
Reporting Limit: 0.7 ppm

(If the reading is greater than ± 0.002 in magnitude, clean cuvettes and redo steps 2a - 2g.)

	No.	Sample ID	Lab ID	$Abs_{initial}$	Abs_{sample}	DF	TNT Conc. (ppm) Calculated	Reported	Comments
	1	**Method Blank**	A-01	0.002	0.001	1	0.0	0.7 U	
	2	**Laboratory Control**	A-02	0.005	0.307	1	0.0	0.7 U	
	3	4V10A ~~3V7C~~	A-03	~~0.014~~ 0.014	0.102	1	0.0	0.7 U	slight brown/pink
	4	~~3V7C~~ 4V10A Lab Dup	A-04	0.009	0.073	1	0.0	0.7 U	Lab. Dup. "
	5	3V7B	A-05	0.024	0.554	1	0.0	0.7 U	dark pink
	6	3V7B FD	A-06	0.023	0.500	1	0.0	0.7 U	"
	7	3V7C ~~4V10A~~	A-07	0.059 ~~0.014~~	0.747	1	0.0	0.7 U	brown/red
	8	4V10B	A-08	0.002	0.005	1	0.0	0.7 U	
	9	4V10C	A-09	-0.004	0.007	1	0.0	0.7 U	
	10	4T10A	A-10	0.000	0.009	1	0.0	0.7 U	
	11	4T10B	A-11	0.001	0.042	1	0.0	0.7 U	light pink
	12	4T10C	A-12	0.003	0.050	1	0.0	0.7 U	"
1.22	~~13~~ 17	~~2T8C FD DL~~	~~A-13~~	~~0.039~~	~~3.253~~	~~5~~	~~479.4~~	~~479.4~~	~~red need 50x dil.~~
.22	~~14~~ 17	2T8C FD DL 4/9	A-14	0.004	0.338	50	0.0	0.7 U	dark pink
.5	~~15~~ 18	2U6A DL (4/10)	A-15	0.005	0.508	50	0.0	0.7 U	light pink
.9	~~16~~ 19	2U6B DL "	A-16	0.003	0.082	50	0.0	0.7 U	pink
.6	~~17~~ 20	2R8A DL 4/9	A-17	~~0.009~~	0.057	10	0.0	0.7 U	
1.7	~~18~~ 21	2R8A FD DL "	A-18	0.014	0.561	10	0.0	0.7 U	
.21	~~19~~ 22	2T8C DL 4/9	A-19	0.007	0.348	50	0.0	0.7 U	
	20		A-20			1	0.0	0.7 U	

Notes: 1) Abs for lab control sample must be between 0.307 to 0.373 for the test to be in control.
2) TNT conc. in method blank must be less than the reproting limit (0.7 ppm).

3	A-13	4V6A	0.004	0.032	1	√ slight pink
4	A-14	4V6B	-0.001	-0.006	1	
5	A-15	4V6B FD	-0.001	-0.005	1	
6	A-16	4V6C	-0.001	-0.006	1	

QA officer Review/Initial: ____________ Date: ________
Laboratory Manager Review ____________ Date: ________

Calculation Worksheet - RDX Analysis

TNT Washout Facility - SWMU 10

Tooele Army Depot - Tooele, Utah

CALCULATION: Abs-(0.014/2.54)
0.0225/2.54

Analysis Date:	4/11/02	RDX Test Kit ID:	1K1125
Batch Number:	B	Analyst Initial:	AS AS
Wavelength:	510 nm	Instrument:	Spectro 22
$Abs_{background}$:	0.001	Reporting Limit:	0.8 ppm

(If the reading is greater than ± 0.002 in magnitude. clean cuvettes and redo steps 2a - 2g.)

No.	Sample ID	Lab ID	Abs_{sample}	DF	RDX Conc. (ppm) Calculated	RDX Conc. (ppm) Reported	Comments
1	**Method Blank**	B-01	0.001	1			
2	**Laboratory Control**	B-02	0.071	1			
3	1T5A	B-03	0.117	5			
4	**1T5A LAB DUP**	B-04	0.139	5			
5	2B8A	B-05	0.125	2			
6	2M8A	B-06	0.003	2			
7	2R8A	B-07	0.168	5			
8	2R8A FD	B-08	0.152	5			
9	2R8B	B-09	0.144	2			
10	2P9B	B-10	0.174	~~10~~ 20	0.390	DF10)	0.174 ½ of DF10 in H₂O
11	2T8A	B-11	0.102	10			
12	2U6A	B-12	0.082	5			
13	3V7A	B-13	0.053	2			
14	3V5B	B-14	0.004	1			
15	3V5C	B-15	0.002	1			
16	2U9A	B-16	0.208	10			
17	2U9A LAB Dup	B-17	0.238	10			
18	2P9B	B-18	0.220	20			
19		B-19		1			
20		B-20		1			

Notes: 1) Abs for lab control sample must be between 0.069 to 0.108 for the test to be in control.
2) RDX conc. in method blank must be less than the reproting limit (0.8 ppm).

QA officer Review/Initial: ____________ Date: ________

Lab. Manager Review/Initia ____________ Date: ________

DATA VALIDATION REPORT - Level III Review

SDG No.: _____TEAD04_______ **Fraction: ______Explosives__________**

Lab: _____DATA CHEM_______ **Project Name: __Tooele Army Deport__**

Reviewer: ______JA________ **Date: ________May 22, 2002_________**

This report presents the findings of a review of the referenced data. The report consists of this summary, a listing of the samples included in the review, copies of data reports with data qualifying flags applied (as required), the data review checklist, supporting documentation, and an explanation of the data qualifying flags employed. The review performed is based on the USEPA National Functional Guidelines for Organic Data Review (February 1994) modified to reflect the level of review requested, the specifics of the analytical method employed, and provisions of the approved project specific QAPP.

Major Anomalies: None.

Minor Anomalies: The equipment blank (2-EB) located in SDG G0239018 contained 2,4,6-trinitrotoluene (2,4,6-TNT) at 0.0954 μg/L. Since 2,4,6-TNT was either non-detected in the associated samples or positive detections were greater than five times the equipment blank concentration, no data qualifying action was taken.

The surrogate recoveries for 3,4-dinitrotoluene (3,4-DNT) were less than the lower control limit (80.5%) due to matrix interference in samples 2T8CLA (76%), 2T8CLAMS (79.9%), and 2T8CLD (79.0%). Since sample 2T8CLAMS is a QC sample, no data qualifying action was taken. Samples 2T8CLA and 2T8CLD were diluted by a factor of five, re-analyzed for 2,4,6-TNT by the laboratory, and displayed similar results. All positive results were flagged "J, s" and non-detects were flagged "UJ, s" in these two samples.

The MS/MSD recoveries for 2,4,6-TNT (163% and 0.512%) were outside the control limits due to matrix interference. Since the 2,4,6-TNT concentration in the parent sample was greater than four times the spiking concentration, no data qualifying action was taken.

2,4,6-TNT results in samples 2R8ALA, 2T8CLA, and 2T8CLD; and the RDX result in sample 2R8ALA exceeded the linear range of the calibration curve. These three samples were diluted by a factor of 5 and reanalyzed by the laboratory. Since only 2,4,6-TNT and RDX results from the dilution analysis were reported on the Form Is, no data qualifying action was taken.

The %RPDs between primary and confirmatory analyses for several explosive compounds were greater than the acceptance limit (40% RPD). These results, except those previously flagged due to surrogate recovery failure, were flagged "J, g" by the reviewer.

Correctable Anomalies: None.

Comments: Compound 2,6-DNT in sample 1T5CLA was not detected in the confirmation analysis. The 2,6-DNT peak is in the retention window and is a distinct peak. Based on the judgement of the analyst, this compound is definitely present. Since this result was less than the reporting limit and was flagged "J" by the laboratory, no further data qualifying action was taken.

Sample 2T8CLA dilution raw data for the confirmation analysis were not provided by the laboratory. The laboratory was contacted and missing data were received.

On the basis of this evaluation, the laboratory appears to have followed the specified analytical method and correctly applied data qualifiers to the results according to the provisions of the site specific QAPP, with the exception of errors discussed above. All data, as qualified, are usable for their intended purpose based on the data reviewed.

Signed: Ri, Chai-Chen

DATA CHEM LABORATORIES
A Sorenson Company

COVER PAGE

ANALYTICAL REPORT FOR
URS Corporation

Phone(301) 652-2215   Fax(301) 656-8059

Form COVER-V1.3
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Page 1

G023801R

DCL Report Group..: 02C-0086-02

Date Printed......: 26-APR-02 13:59

Project Protocol #: P0232001 --
Client Ref Number.: TEAD SWMU 10(a) Su
Release Number....: TEAD04

Analysis Method(s): 8330

URS Corporation
Attention: Ed Fahnline
7101 Wisconsin Ave., Suite 320
Bethesda, MD 20814

Client Sample Name	Laboratory Sample Name	Date Sampled	Date Received
Method Blank	BL-194427-1	NA	NA
LCS	QC-194427-1	NA	NA
1T5CLA	02C00733	08-APR-02	09-APR-02
1H4BLA	02C00734	08-APR-02	09-APR-02
2J7BLA	02C00735	08-APR-02	09-APR-02
2R8ALA	02C00736	08-APR-02	09-APR-02
2T8CLA	02C00737	08-APR-02	09-APR-02
2L7BMS	02C00737MS	08-APR-02	09-APR-02
2L7BMD	02C00737MSD	08-APR-02	09-APR-02
2T8CLD	02C00738	08-APR-02	09-APR-02

Thomas T. McKay   4-26-02
Analyst: Thomas T McKay   Date

Gloria W. Heung   4-29-02
Reviewer: Gloria W. Heung   Date

Richard W. Wade   4/29/02
Lab Supervisor: Richard W. Wade   Date

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

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S023804K

Date Printed.........: 26-APR-02 13:59

Client Name..........: URS Corporation
Client Ref Number....: TEAD SWMU 10(a) SubC # 33237
Sampling Site........: Not Provided
Release Number.......: TEAD04

Date Received........: 09-APR-02 00:00

DCL Preparation Group: G023J027
Date Prepared........: 18-APR-02 00:00
Preparation Method...: 8330
Aliquot Weight/Volume: 2.0g
Net Weight/Volume....: Not Required

Client Sample Name: 1T5CLA
DCL Sample Name...: 02C00733
DCL Report Group..: 02C-0086-02

Matrix............: SOIL
Date Sampled......: 08-APR-02 07:40
Reporting Units...: µg/g
Report Basis......: ☐ As Received ☒ Dried
Percent Moisture..: 20.7

DCL Analysis Group: G023J027
Analysis Method...: 8330
Instrument Type...: HPLC
Instrument ID.....: LC-8
Column Type.......: Ultracarb ODS
☒ Primary
☐ Confirmation

Analytical Results

Analyte	Date Analyzed	MDL	Result	Comment	Qual.	Dilution	CRDL	
1,3,5-Trinitrobenzene	24-APR-02 16:46	0.0113	4.97			1	0.10	J,g
1,3-Dinitrobenzene	24-APR-02 16:46	0.0117	ND		U	1	0.10	
2,4,6-Trinitrotoluene	24-APR-02 16:46	0.0187	0.869			1	0.20	J,g
2,4-Dinitrotoluene	24-APR-02 16:46	0.0140	0.148		J	1	0.20	J,g
2,6-Dinitrotoluene	24-APR-02 16:46	0.0205	0.177		J	1	0.20	J,g
2-Amino-4,6-Dinitrotoluene	24-APR-02 16:46	0.0315	ND		U	1	0.20	
2-Nitrotoluene	24-APR-02 16:46	0.0381	ND		U	1	0.40	
3-Nitrotoluene	24-APR-02 16:46	0.0702	ND		U	1	0.40	
4-Amino-2,6-Dinitrotoluene	24-APR-02 16:46	0.0444	ND		U	1	0.20	
4-Nitrotoluene	24-APR-02 16:46	0.0401	ND		U	1	0.40	
HMX	24-APR-02 16:46	0.0290	0.379			1	0.20	J,g
Nitrobenzene	24-APR-02 16:46	0.0369	ND		U	1	0.20	
RDX	24-APR-02 16:46	0.0350	1.05			1	0.20	J,g
Tetryl	24-APR-02 16:46	0.0780	ND		U	1	0.20	

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
3,4-Dinitrotoluene	4.15	5.00	83.0

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
04260213590880
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S023804L

Date Printed.........: 26-APR-02 13:59

Client Name..........: URS Corporation
Client Ref Number....: TEAD SWMU 10(a) SubC # 93237
Sampling Site........: Not Provided
Release Number.......: TEAD04

Date Received........: 09-APR-02 00:00

DCL Preparation Group: G023J027
Date Prepared........: 18-APR-02 00:00
Preparation Method...: 8330
Aliquot Weight/Volume: 2.0g
Net Weight/Volume....: Not Required

Client Sample Name: 1H4BLA
DCL Sample Name...: 02C00734
DCL Report Group..: 02C-0086-02

Matrix............: SOIL
Date Sampled......: 08-APR-02 08:37
Reporting Units...: µg/g
Report Basis......: ☐ As Received ☒ Dried
Percent Moisture..: 24.5

DCL Analysis Group: G023J027
Analysis Method...: 8330
Instrument Type...: HPLC
Instrument ID.....: LC-8
Column Type.......: Ultracarb ODS
☒ Primary
☐ Confirmation

Analytical Results

Analyte	Date Analyzed	MDL	Result	Comment	Qual.	Dilution	CRDL	
1,3,5-Trinitrobenzene	24-APR-02 17:19	0.0113	ND		U	1	0.10	
1,3-Dinitrobenzene	24-APR-02 17:19	0.0117	ND		U	1	0.10	
2,4,6-Trinitrotoluene	24-APR-02 17:19	0.0187	ND		U	1	0.20	
2,4-Dinitrotoluene	24-APR-02 17:19	0.0140	ND		U	1	0.20	
2,6-Dinitrotoluene	24-APR-02 17:19	0.0205	ND		U	1	0.20	
2-Amino-4,6-Dinitrotoluene	24-APR-02 17:19	0.0315	ND		U	1	0.20	
2-Nitrotoluene	24-APR-02 17:19	0.0381	ND		U	1	0.40	
3-Nitrotoluene	24-APR-02 17:19	0.0702	ND		U	1	0.40	
4-Amino-2,6-Dinitrotoluene	24-APR-02 17:19	0.0444	ND		U	1	0.20	
4-Nitrotoluene	24-APR-02 17:19	0.0401	ND		U	1	0.40	
HMX	24-APR-02 17:19	0.0290	0.243			1	0.20	J,g
Nitrobenzene	24-APR-02 17:19	0.0369	ND		U	1	0.20	
RDX	24-APR-02 17:19	0.0350	0.211			1	0.20	J,g
Tetryl	24-APR-02 17:19	0.0780	ND		U	1	0.20	

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
3,4-Dinitrotoluene	4.23	5.00	84.5

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FORM A (TYPE I)
SINGLE METHOD ANALYSES

SAMPLE ANALYSIS DATA SHEET

Form RLIMS63A-V1.3
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S023804M

Date Printed.........: 26-APR-02 13:59

Client Name..........: URS Corporation
Client Ref Number....: TEAD SWMU 10(a) SubC # 93237
Sampling Site........: Not Provided
Release Number.......: TEAD04

Date Received........: 09-APR-02 00:00

DCL Preparation Group: G023J027
Date Prepared........: 18-APR-02 00:00
Preparation Method...: 8330
Aliquot Weight/Volume: 2.0g
Net Weight/Volume....: Not Required

Client Sample Name: 2J7BLA
DCL Sample Name...: 02C00735
DCL Report Group..: 02C-0086-02

Matrix............: SOIL
Date Sampled......: 08-APR-02 11:57
Reporting Units...: µg/g
Report Basis......: ☐ As Received ☒ Dried
Percent Moisture..: 2.9

DCL Analysis Group: G023J027
Analysis Method...: 8330
Instrument Type...: HPLC
Instrument ID.....: LC-8
Column Type.......: Ultracarb ODS
☒ Primary
☐ Confirmation

Analytical Results

Analyte	Date Analyzed	MDL	Result	Comment	Qual.	Dilution	CRDL
1,3,5-Trinitrobenzene	24-APR-02 17:51	0.0113	ND		U	1	0.10
1,3-Dinitrobenzene	24-APR-02 17:51	0.0117	ND		U	1	0.10
2,4,6-Trinitrotoluene	24-APR-02 17:51	0.0187	ND		U	1	0.20
2,4-Dinitrotoluene	24-APR-02 17:51	0.0140	ND		U	1	0.20
2,6-Dinitrotoluene	24-APR-02 17:51	0.0205	ND		U	1	0.20
2-Amino-4,6-Dinitrotoluene	24-APR-02 17:51	0.0315	ND		U	1	0.20
2-Nitrotoluene	24-APR-02 17:51	0.0381	ND		U	1	0.40
3-Nitrotoluene	24-APR-02 17:51	0.0702	ND		U	1	0.40
4-Amino-2,6-Dinitrotoluene	24-APR-02 17:51	0.0444	ND		U	1	0.20
4-Nitrotoluene	24-APR-02 17:51	0.0401	ND		U	1	0.40
HMX	24-APR-02 17:51	0.0290	1.63			1	0.20
Nitrobenzene	24-APR-02 17:51	0.0369	ND		U	1	0.20
RDX	24-APR-02 17:51	0.0350	20.5			1	0.20
Tetryl	24-APR-02 17:51	0.0780	ND		U	1	0.20

J,g

Surrogate Recoveries

Analyte	Result	Spiked Amount	Percent Recovery
3,4-Dinitrotoluene	4.17	5.00	83.4

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ATTACHMENT E
Field Screening vs. EPA Method SW846-8330
Correlation Analysis

ATTACHMENT E

Field Screening vs. EPA Method SW846-8330
Correlation Analysis

When remedial action decisions are partially based on the results of field screening data, EPA guidance suggests the need to test the accuracy and precision of those data by some alternative and more definitive means. In general, field screening results are confirmed by having an independent laboratory analyze approximately 10 percent of the data points from split samples. If the results of the confirmation analyses and the field screening techniques agree, the field screening data can be used in decision making with a high degree of confidence.

The statistical tests include regression analysis and both parametric and nonparametric approaches to comparing group means and variances. The details of these methods are extensively described in the literature and are not repeated herein.

Seventeen soil samples were split and analyzed in both the field (using colorimetric test kit methods) and the confirmation laboratory (using EPA Method SW846-8330). The field test kit results are reported as RDX and 2,4,6-TNT. The confirmation laboratory method quantitatively analyzes RDX and TNT, as well as other explosives that are detectable by the field kits.

The field test kits do not discriminate within certain classes of compounds. As a consequence, the RDX or TNT test kits report a measured value for any or all analytes present in a soil sample to which the kit is sensitive. The analyte classes and associated method detection limits (MDLs) for the test kits are shown below:

Field Test Kit Method Detection Limits by Compound Class (a)

Compound	MDL Soil (ppm)	Compound	MDL Soil (ppm)
RDX	0.8	2,4,6-TNT	0.7
HMX	2.4	2,4-DNT	0.5
PETN	1.0	2,6-DNT	2.1
Nitroglycerine	8.9	1,3,5-TNB	0.5
Nitroguanadine	10.1	1,3-DNB	<0.5
Nitrocellulose	42.2	Tetryl	0.9
		2-NT	>100
		3-NT	>100
		4-NT	>100
		4-AMDNT	>100
		NB	>100

(a) MDLs are taken from manufacturer's literature.

The RDX field test kit detects all of the listed nitroamines and related compounds, and the TNT kit detects the listed nitrotoluene/nitrobenzene compounds. However, the sensitivity of the test kit methodology varies depending on the analyte measured. For example, if the compound RDX is present in a soil sample at 2.4 ppm, the reported result for the test is 2.4 ppm. However, if the same soil sample contains only HMX, the same 2.4-ppm concentration is reported as 1.0 ppm as RDX. The associated test kit result is reported as zero, or nondetect, in those instances where the sum of all analytes present is less than 0.8 ppm as RDX. Finally, and perhaps most importantly, a sample containing RDX at 2.4 ppm and HMX at 2.4 ppm results in a reported total concentration of 3.4 as RDX. Thus, to compare the field test kit results to laboratory results, the sum of the all contributing compounds must be calculated, taking into account the differential sensitivity of the test kit to the various compounds.

Analytical results were evaluated for accuracy in the measurements using linear regression. Accuracy is a measure of how close the measured value is to the true value. In this application, the confirmation laboratory concentrations are accepted as the true value (independent variable), and the field test kit result is taken as the measured (dependent) value. This is based on the presumption that the definitive data produced by the confirmation laboratory is more accurate and precise, qualitatively and quantitatively, than the screening level data produced by the field test kits.

If the field and laboratory analytical methods yield the same concentration value for an identical sample, the data will have a linear regression coefficient of 1.0; a plot of these data conforms to a line with a slope of 1.0 and a y-intercept of zero. Thus, determining how well the analytical methods fit such a line can test their correlation. This is the purpose of linear regression analysis.

Figures E-1 and E-2 present the regression results for the RDX and TNT data. (These data reflect the addition of all other detections in the compound class for the laboratory results.) The correlation coefficients (R2) are 0.49 and 0.98 for RDX and TNT, respectively. The TNT correlation suggests a close fit of the data to a straight line. However, for RDX the correlation is not as good. The deviation is largely due to a very high RDX result in 2R8A (522 mg/kg) from the laboratory. HMX was reported at 32 mg/kg by the laboratory. At sample 3V7B, the fixed and field laboratory results showed far better correlation. We suggest that at levels requiring dilution, both laboratory and field results may have greater uncertainty. Except for the highest sample, RDX correlation was quite linear.

The measurement of decision maker's risk – perhaps the most important of all measurements considered here – is based on the premise that the field and confirmation laboratory data match to an acceptable degree if the decision to be based on the two data points is the same. To the degree that the decision would differ depending on the datum, the decision maker's risk increases. Thus, this measure is presented as a percent decision match.

Figure E-1: RDX Regression Test

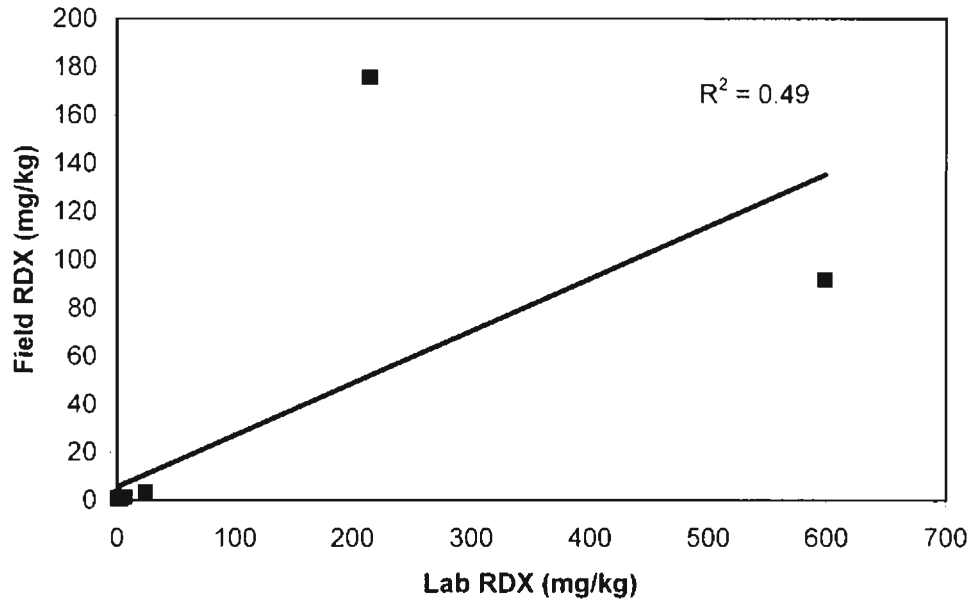
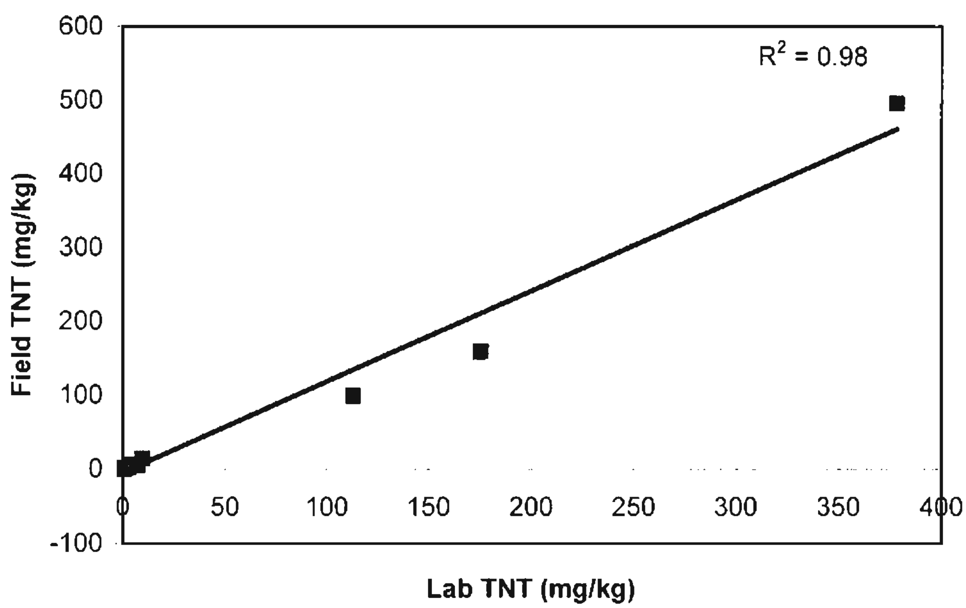


Figure E-2: TNT Regression Test



An evaluation was made to test the utility of the field test kit data in decision making. If both field and fixed laboratory sample results are interpreted the same (i.e., sample does or does not exceed CAO), then they demonstrate a decision match. If, however, field testing results would cause an opposite decision from laboratory results, then there is a decision mis-match. The following table presents whether a sample would trigger an area to be cleaned up or left in place based on CAO comparison.

Decision Match Summary				
Location	**RDX Decision (1)**	**Match?**	**TNT Decision (2)**	**Match?**
1E6C	Leave	Yes	Leave	Yes
1H4B	Leave	Yes	Leave	Yes
1H5C	Leave	Yes	Leave	Yes
1I8C	Leave	Yes	Leave	Yes
1K6C	Leave	Yes	Leave	Yes
1N7C	Leave	Yes	Leave	Yes
1P3C	Leave	Yes	Leave	Yes
1S7C	Leave	Yes	Clean up	Yes
1T5C	Leave	Yes	Leave	Yes
2J7B	Leave	Yes	Leave	Yes
2R8A	Clean up	Yes	Clean up	Yes
2T8C	Leave	Yes	Clean up	Yes
2U4B	Leave	Yes	Leave	Yes
3A9A	Leave	Yes	Leave	Yes
3O10B	Leave	Yes	Leave	Yes
3V7B	Clean up	Yes	Leave	Yes
4X6B	Leave	Yes	Leave	Yes

(1) Based on a comparison to an RDX clean up of 31 mg/kg applied at any depth.
(2) Based on a comparison to an TNT clean up of 86 mg/kg applied at any depth.

In this evaluation, we compare the results obtained from the confirmation laboratory and the field laboratory to the soil cleanup level. The purpose of this comparison is to assess the degree to which a decision maker would conclude that the action level had or had not been exceeded based on the two sets of data. In many ways, this manner of assessment is perhaps the most important because it focuses on the decision maker's risk in choosing one alternative over another.

For this effort, the lowest CAO (i.e., a surface soil clean up level) was applied to test the decision matching. As summarized in the preceding table, in every case, a decision-maker would make the same conclusion 100 percent of the time regarding whether to cleanup an area of soil or leave it in place. From a practical view point, field data may be used with confidence for decision making.

In summary, the RDX and TNT field kits provide adequate precision and accuracy compared with confirmation laboratory analyses to suggest that the data may be used with confidence for decision making. Confirmatory sampling is still recommended following any excavation for precise calculations of residual risk.